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Strategy for Conducting Literature Searches for Carbon Tetrachloride (CCL₄): Supplemental Document to the TSCA Scope Document

CASRN: 56-23-5

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1 Overall Approach

This appendix describes EPA/OPPT's initial methods, approaches and procedures for identifying, compiling, and screening publicly available information supporting TSCA risk evaluation for carbon tetrachloride (CCL4). The literature searches were conducted by EPA¹ and contractor² staff for the following seven broad topic areas:

1. Physical/chemical properties (hereafter "pchem properties"),
2. Conditions of use of CCL4, including known, intended, and reasonably foreseen industrial, commercial, and consumer uses,
3. Fate and transport in the environment (hereafter "fate"),
4. Chemical engineering/occupational exposure and environmental releases (hereafter "engineering"),
5. General population, consumer, and ecological exposure (hereafter "exposure"),
6. Human health hazard identification and dose-response (hereafter "human health hazard"), and
7. Environmental hazard identification and concentration-response (hereafter "environmental hazard")

The following steps were generally conducted, with the exception of topic areas #1, 2 and 7:

1. Define the specific objectives of the literature search as part of the overall systematic review
2. Develop specific search strategies and execute search
3. Develop inclusion/exclusion criteria to determine which search results are "on-topic" versus "off-topic"
4. Develop topic-specific categories (or tags) to further categorize the search results
5. Screen literature search results
6. Validate the search strategy and tagging procedure (ongoing)

EPA[NOTEREF _Ref483310711 \h * MERGEFORMAT] and contractors[NOTEREF _Ref483310718 \h * MERGEFORMAT]

worked simultaneously to conduct the literature searches and leveraged existing information, wherever possible, to facilitate the data gathering effort supporting the risk evaluation. The current process included the following:

- EPA/OPPT chemists conducted the literature searches for pchem properties (topic area #1, Section [REF _Ref483301233 \r \h]) using an approach similar to the one used in the TSCA New Chemicals Program, but not the steps described above. When applicable, the chemists relied on literature already gathered in previous EPA/OPPT assessments to support the characterization of pchem properties.

¹ EPA staff supported the literature searches for topic areas 1 and 2.

² ICF supported the literature searches for topic areas 3 to 6. ERG supported supplemental searches under topic area #4 to develop the life cycle diagrams. CSRA supported the literature search for ecological data under topic area #7.

- EPA/OPPT staff consulted a variety of sources to identify conditions of use (topic area #2) and to develop the *Preliminary Information on Manufacturing, Processing, Distribution, Use and Disposal for Carbon Tetrachloride* (hereafter “public use documents”)³. Though the strategy did not include all the steps described above, EPA/OPPT included information reported to EPA, literature searches, trade publications, and reports developed for prior EPA and international assessments. These public use documents were used to elicit public feedback on conditions of use of the priority chemicals during and following a public meeting on February 14, 2017. Relevant public input was incorporated into this chemical’s scope document.
- Searches for the fate, exposure, engineering and human health literature (topic areas #3 to 6) were conducted to (1) support the development of the initial life cycle and conceptual model diagrams, and (2) broadly capture information that would be necessary for preparing the environmental and occupational exposure and risk assessments⁴. These searches followed the steps described above.
- EPA/OPPT searched and screened the ecological literature following well accepted methods, approaches and procedures established for the ECOTOX knowledge base and used in EPA’s ecological risk assessments⁵ (topic area #7). In general, the process was similar to the one outlined above.

Subsequent sections describe the steps undertaken for each of these topic areas, with additional detail provided in the Appendices. Since the strategies for topic areas 3, 4, 5 and 6 (i.e., fate, engineering, exposure, and human health hazard) are similar, their strategies are in the same section.

The results of the initial search based on title and abstract screening can be found in the “Carbon Tetrachloride (CASRN: 56-23-5) Bibliography: Supplemental File for the TSCA Scope Document”. EPA/OPPT is currently evaluating the performance of the search and screening strategy (step 6) prior to commencing full-text screening. The literature search strategy may be refined and updated as the assessment progresses. Also, EPA/OPPT anticipates refinements to the literature search and screening strategy across chemicals to optimize the process for future chemicals.

2 Step 1: Define Specific Objectives for the Searches

The information needs for each topic area were developed to translate the broad regulatory mandate of TSCA into questions that could be clearly addressed with the literature search. [REF _Ref482701339 \h * MERGEFORMAT] [REF _Ref482701339 \h * MERGEFORMAT] provides

³ Initial compilation of data and/or information reported in the *Preliminary Information on Manufacturing, Processing, Distribution, Use and Disposal for Carbon Tetrachloride* released as part of the background materials for the public meeting on risk evaluation scoping efforts under TSCA for 10 chemical substances (February 14, 2017; [HYPERLINK "https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/public-meeting-risk-evaluation-scoping-efforts-under-0"]).

⁴ Topic areas #2 and #4 complement each other.

⁵ ECOTOX database: [HYPERLINK "https://cfpub.epa.gov/ecotox/"]. EPA’s Office of Pesticides (OPP) and the Office of Research and Development (ORD) frequently use ECOTOX for ecological risk assessments.

a broad overview of the information needs for each topic area. A full list of information needs is provided in Appendix [REF _Ref482712540 \n \h * MERGEFORMAT] for most of the topic areas. Note that general information needs for pchem properties, information on conditions of use and environmental hazard are in [REF _Ref482701339 \h * MERGEFORMAT], but not in Appendix [REF _Ref482712620 \n \h * MERGEFORMAT]. The ECOTOX standard operating procedures (SOPs) provide details about the information needs driving the ecological literature searches⁶.

Table [STYLEREf 1 \s]-[SEQ Table * ARABIC \s 1]. Overview of Literature Search for Carbon Tetrachloride across All Topic Areas

Discipline	Information needs
Physical/Chemical Properties	<ul style="list-style-type: none"> Collection of pchem properties to inform the fate, exposure and hazard assessments of the risk evaluation
Conditions of Use ¹	<ul style="list-style-type: none"> Known, intended, and reasonably foreseen conditions of use, including manufacturing, processing, distribution, industrial, commercial and consumer uses, and disposal
Fate	<ul style="list-style-type: none"> Environmental mobility Environmental degradation Bioaccumulation and environmental persistence Wastewater removal processes
Engineering	<ul style="list-style-type: none"> Lifecycle and process related information Environmental releases Occupational exposure
Exposure	<ul style="list-style-type: none"> Lifecycle information to inform general population and consumer exposures Media concentrations in the environment Biomonitoring data Information to identify potentially exposed and susceptible subpopulations
Human Health Hazard	<ul style="list-style-type: none"> Information about health hazards including critical health effects and corresponding points of departure, associated with exposure via all routes, durations, sources, and pathways Characterization of exposure for general and potentially exposed and susceptible subpopulations Toxicokinetics Mode of action (MOA) Information to identify potentially exposed and susceptible subpopulations²
Environmental Hazard	<ul style="list-style-type: none"> Information about environmental hazards associated with acute and chronic toxic effects on aquatic and terrestrial species

Notes:

- The initial literature search and compilation of data and/or information are in the *Preliminary Information on Manufacturing, Processing, Distribution, Use and Disposal for Carbon Tetrachloride* released to the public in February 2017 as part of the background materials for the public meeting on risk evaluation scoping efforts under TSCA for 10 chemical substances (February 14, 2017; Docket ID EPA-HQ-OPPT-2016-0733 at [regulations.gov](https://www.epa.gov/regulations.gov) and also at [HYPERLINK "https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/public-meeting-risk-evaluation-scoping-efforts-under-0"]). Also, EPA's "Use and Market Profile for Carbon Tetrachloride" contains data and/or information on conditions of use in the scope document (EPA, 2017b).
- Literature search for identifying potentially exposed and susceptible subpopulations was designed to be broad to capture information about possible susceptible subpopulations such as infants, children, pregnant women, and elderly.

⁶ ECOTOX and related SOPs ([HYPERLINK "https://cfpub.epa.gov/ecotox/help.cfm?helptabs=tab4"])

3 Step 2: Develop Search Strategies

EPA/OPPT considered different categories of data sources when developing the search strategies:

1. Existing problem formulations, draft or final assessments completed by U.S. government agencies (e.g., EPA IRIS assessments⁷),
2. Databases containing peer-reviewed literature (e.g., PubMed, Web of Science),
3. Gray literature, which is defined as the broad category of studies not found in standard, peer-reviewed literature databases (e.g., PubMed). Gray literature includes studies that are difficult to find in conventional bibliographic databases, such as white papers, conference proceedings, technical reports, reference books, dissertations, and information on various stakeholder websites.

[REF_Ref482712691 \h * MERGEFORMAT] provides an overview of the search strategies for CCL4. Additional details, including full lists of search terms and sources, are provided in Appendix [REF_Ref482712742 \n \h * MERGEFORMAT] (peer reviewed literature) and Appendix [REF_Ref482712763 \n \h * MERGEFORMAT] (gray literature).

Table [STYLeref 1 \s]-[SEQ Table * ARABIC \s 1]. Overview of Search Strategies for Carbon Tetrachloride by Topic Area and Source Type

Discipline	Use of Existing Assessments ¹	Peer-Reviewed Literature Database Search Strategies	Gray Literature Search Strategies
Physical/Chemical Properties	see footnote 1	Databases: public databases that redirect to primary sources; see “Search Strategies for Physical/Chemical Properties” section Date limit: none Key Words: CAS Registry Number (CASRN), chemical name, and chemical structure	Sources: public databases; see “Search Strategies for Physical/Chemical Properties” section Date limit: none Key words: CAS Registry Number (CASRN), chemical name, and chemical structure
Conditions of Use	see footnote 1	Databases: see “Search Strategies for Conditions of Use” section Date limit: Safety Data Sheets: 2000; see “Search Strategies for Conditions of Use” section Key Words: CAS Registry Number (CASRN), chemical names, synonyms, trade names, and common misspellings	Sources: list of resources; see “Search Strategies for Conditions of Use” section Date limit: none; “Search Strategies for Conditions of Use” section for more information Key words: CAS Registry Number (CASRN), chemical names, synonyms, trade names, and common misspellings
Fate, Engineering, and Exposure	ATSDR Toxicological Profile August 2005	Databases: Web of Science Date limit: none; search conducted February 28, 2017	Sources: Curated list of resources; see Appendix [REF_Ref482712959 \n \h]

⁷ Integrated Risk Information System (IRIS), [HYPERLINK "https://www.epa.gov/iris"]

		Key Words: See Appendix [REF _Ref482712970 \n \h]	Date limit: none; search conducted February 7-28, 2017 Key words: Varies by source; see Appendix [REF _Ref482712996 \n \h]
Human Health Hazard	Final IRIS Assessment to identify literature published through February 2009	Databases: PubMed, Web of Science, and Toxline Date limit: January 1, 2009 – March 1, 2017 Key Words: See Appendix [REF _Ref482712986 \n \h]	
Environmental Hazard	see footnote 1	Databases: Science Direct, Agricola, Toxline, Scifinder, Proquest. Refer to ECOTOX SOP ² Date limit: none; search conducted January 13, 2017 Key Words: See Appendix [REF _Ref482713027 \n \h]	Sources: Curated list of resources, see Appendix [REF _Ref482713010 \n \h]. Date limit: none; search conducted January 13, 2017 Key words: Varies by source; see Appendix [REF _Ref482713017 \n \h]

Notes:

¹ In general, EPA/OPPT existing chemical assessments, EPA's IRIS assessments and ATSDR Toxicological Profiles were used if available. EPA/OPPT assessments may include draft or final TSCA Work Plan risk assessments and final problem formulations. When available, the EPA/OPPT assessments were used to identify pertinent references supporting pchem properties, fate, use, exposure and hazard information. An ATSDR Toxicological Profile and IRIS assessment have been developed for carbon tetrachloride. EPA/OPPT obtained the search results from the IRIS program and listed the identified literature as relevant for the TSCA risk evaluation for carbon tetrachloride. Peer-reviewed and gray literature search strategies were designed to supplement the search strategies of existing assessments where possible.

² *ECOTOX Literature Searches, Citation Identification and Skimming*" ([HYPERLINK "https://cfpub.epa.gov/ecotox/blackbox/help/ECOTOXLiteratureSearchesCitationIdentificationandSkimming.pdf"])

3.1 Search Strategies for Physical/Chemical Properties

Most of the physical/chemical (pchem) property searches were already conducted when EPA/OPPT was preparing the TSCA Work Plan Problem Formulation and Initial Assessment for CCL4. The physical/chemical information pchem properties cited in the problem formulation document was retained for the scope document unless the chemist found newer studies through supplemental searches between December 2016 and March 2017.

The general approach for determining pchem properties is to first search for the specific substance in question (using CAS Registry Number (CASRN), chemical name, or the chemical structure) by following an organized path of literature and database sources, starting with public databases such as STN and REAXYS online, which links directly to the primary references. Additional searches may be conducted using resources such as ChemSpider, which provides both measured and predicted values, with limited primary references. If the exact substance cannot be found, then close structural analogs may be located and their property values extrapolated to the substance in question, or by computer estimation programs. All estimated values as well as measured ones are critically reviewed and deemed reasonable based on professional judgement. Values that are sought, as a minimum, for any physical/chemical pchem property search include: the physical state of the substance at ambient temperature (gaseous, liquid, or solid), melting point (MP) for solids, normal boiling point (BP) at 760 mmHg for liquids, vapor pressure (ideally at 25 °C), solubility in water (ideally at 25 °C) and octanol/water partition coefficient (log Kow).

3.2 Search Strategies for Conditions of Use

EPA/OPPT conducted internet searches between December 2016 and January 2017 to identify the conditions of use of CCL4, using CAS numbers, chemical names, synonyms, trade names, and common misspellings. Various sources were searched including, but not limited to, information reported to EPA (e.g., Chemical Data Reporting⁸ and the Toxics Release Inventory⁹), trade publications, reports in the open literature, or citations in EPA and international assessments¹⁰. To identify formulated products, EPA searched for safety data sheets (SDS) using internet searches, EPA's Chemical and Product Categories (CPCat) data, the National Institute for Health's (NIH) Household Product Database, and other resources in which a SDS could be found. Each SDS was then cross-checked with company websites to make sure that each product SDS was current. The list of products was crosschecked with public data, publicly available literature, and trade publications to find known uses of CCL4. SDS dated prior to 2000 were excluded if additional sources supporting their accuracy could not be located.

The full list of data sources for conditions of use information can be found in the public use document for CCL4 released as background material for the public meeting on February 14, 2017 ([HYPERLINK "<https://www.regulations.gov/docket?D=EPA-HQ-OPPT-2016-0733>"]). EPA/OPPT also communicated with companies and industry groups to make sure the list of uses was correct, complete, and up-to-date. EPA/OPPT integrated into the scope document for this chemical relevant public input submitted to the docket for the public meeting (EPA-HQ-OPPT-2017-0002) and for this chemical, (EPA-HQ-OPPT-2016-0733), as well as information from other engagements with stakeholders. Summaries of the public engagement are in this chemical's docket (EPA-HQ-OPPT-2016-0733). Updated information about conditions of use were considered more current than information from the Problem Formulation and preferentially included in the scope document.

3.3 Search Strategies for Fate, Engineering/Occupational Exposure, Exposure, and Human Health Hazard

A broad search and a targeted search were conducted. The fate, engineering, exposure, and human health hazard topic areas were searched broadly to capture data and/or information that would be necessary for preparing the environmental and occupational exposure assessments. For the scope documents, a second targeted search was conducted to locate information needed to create the lifecycle diagrams and conceptual models. The first three sections below discuss the broad search, while the fourth describes the targeted lifecycle/conceptual model search.

3.3.1 Use of Existing Assessments

Where possible, EPA/OPPT used existing U.S. government assessments or summaries as a starting point for the literature searches when these assessments asked similar literature search questions to the current TSCA assessment. For CCL4, the 2010 final IRIS Toxicological Review was used as a starting point; the IRIS search strategy is described.

⁸ Chemical Data Reporting (CDR) under TSCA: [HYPERLINK "<https://www.epa.gov/chemical-data-reporting>"]

⁹ Toxics Release Inventory (TRI) Program: [HYPERLINK "<https://www.epa.gov/toxics-release-inventory-tri-program>"]

¹⁰ e.g., EPA/OPPT TSCA Work Plan assessments, [HYPERLINK "<https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/assessments-tsca-work-plan-chemicals>"]

The 2010 final IRIS Toxicological Review for carbon tetrachloride was used as the starting point for the human health hazard searches. The literature search strategy for the IRIS assessment was based on the Chemical Abstracts Service Registry Number (CASRN) and at least one common name. The relevant literature was reviewed through February 2009. All studies cited in the 2010 IRIS Toxicological Review were evaluated as to whether they were on-topic for human health. A supplemental literature search was conducted to identify new literature published after the IRIS assessment using the search strategy presented in Appendix [REF _Ref482713050 \n \h * MERGEFORMAT]. PubMed, Web of Science, and Toxline were searched from January 1, 2009 to March 1, 2017.

3.3.2 Peer-Reviewed Literature Database Search Strategies

A professional librarian developed the database search strategies for each topic area by:

- 1) Considering search terms and data sources identified by EPA/OPPT's assessment team,
- 2) Considering strategies used for human health hazard in IRIS documents,
- 3) Incorporating known chemical synonyms for CCL4 (see Appendix [REF _Ref482713060 \n \h * MERGEFORMAT]), and
- 4) Tailoring terms for each database to make use of any additional details or categories available in that database (e.g., MeSH terms for the PubMed search strategy and research areas for the Web of Science search).

Relevant subject headings and text words were crafted into a search strategy that was designed to maximize the sensitivity and specificity of the search results (Appendix [REF _Ref482712742 \n \h]). Because each database has its own search architecture, the resulting search strategy was tailored to account for each database's unique search functionality. The search strategies were executed, and EPA/OPPT is in the process of assessing their performance (see Section 6).

Literature search results were imported into EndNote® reference management software to automatically remove duplicates. Since EndNote may not remove all duplicates, additional duplicates were identified and removed manually by comparing fields (e.g., title, author, year). All of the unique references were then sent to Health & Environmental Research Online (HERO)¹¹, where they were assigned a unique HERO ID linked to their citation information.

3.3.3 Gray Literature Search Strategies

Automated searches were used to gather information from the gray literature using Google API (application program interface), with custom code to “scrape” (i.e., locate and download) all the targeted PDFs (e.g., NIOSH Health Hazard Evaluations). Some sites required manual searching, including databases and those with internal search functions (see Table_Apx C-2). The complete list of sites and search methods is in Appendix [REF _Ref482713080 \n \h * MERGEFORMAT].

The following data sources were considered when generating the list of websites/sources to search:

- Lists of sources identified by EPA/OPPT's assessment team,

¹¹ EPA/OPPT plans to use the HERO database for the draft risk evaluation, <https://hero.epa.gov/hero/>.

- U.S. and International Government and Non-Government Organizations (NGOs) websites,
- Chemical/production dictionaries/encyclopedias,
- References used for the searches for conditions of use identified in EPA/OPPT's public use documents,
- State government websites covering environmental quality/management, environmental health/human health, and occupational health and safety,
- Trade Associations websites of member organizations from the National Association of Manufacturers ([HYPERLINK "http://www.nam.org/Alliances/CMA/CMA-Member-Organizations/"]) and additional trade groups identified by the assessment team (Appendix [REF _Ref482713105 \n \h * MERGEFORMAT]). Each trade group website was reviewed to identify data and/or information related to the potential uses of CCL4 based on the information reported in the public use document. If the industrial sector was likely to engage in use activity identified in the public use document, the sector was included in the list of trade associations.

In general, different search terms were required for the different sources depending on the content structure of the website; all sources and search terms are documented in Appendix [REF _Ref482713112 \n \h * MERGEFORMAT]. EPA/OPPT created an initial list and then critically evaluated the utility of each source while executing the searches. Some sites were found to provide duplicative or proprietary information or to be under construction while the search was conducted, and these were removed from consideration. Sites that were initially considered but removed during the search process are also listed in Appendix [REF _Ref482713117 \n \h * MERGEFORMAT].

The search was performed by going to all URLs in the gray literature sources list and searching for CCL4-specific information. The search results were either PDF's or a URL describing the search result. Because each result did not have a pre-made citation that could appear in a bibliography, each search result was assigned as a specific "result ID", and the PDF was named to match that result ID.

3.3.4 Initial Lifecycle/Conceptual Model Targeted Search

Specific sources from the gray literature search were used to inform the initial lifecycle diagram and initial conceptual models; these sources were chosen based on existing SOPs and expert judgment by engineers. The sources searched are denoted in Appendix [REF _Ref482713124 \n \h * MERGEFORMAT] with an asterisk. In addition, the existing draft assessment for CCL4 was consulted for on-topic information. The results of the search are included in the *"Carbon Tetrachloride (CASRN: 56-23-5) Bibliography: Supplemental File for the TSCA Scope Document"*. As with the broad gray literature search, the search was performed by going to the URLs and searching for CCL4-specific information. The search results were either PDF's or a URL describing the search result.

3.4 Search Strategies for Environmental Hazard

For the ECOTOX database, the ecological literature was identified through comprehensive and well-documented literature searches using the ECOTOX SOPs¹². These searches are conducted manually or electronically. Manual searches consist of skimming of reference sections of review

¹² ECOTOX and related SOPs ([HYPERLINK "https://cfpub.epa.gov/ecotox/help.cfm?helptabs=tab4"])

or summary articles that are not the primary source of data, and papers that document test method procedures. Electronic searches consist of searching electronic abstracting services such as Science Direct, Agricola, Toxline, Scifinder, and Proquest. Sources and search terms are documented in Appendix [REF_Ref482713136 \n \h * MERGEFORMAT].

4 Step 3 and 4: Develop Inclusion/Exclusion Criteria and Tags to Categorize Search Results

4.1 Inclusion/Exclusion Criteria for Physical/Chemical Properties

Pchem studies were eligible for inclusion if they provided values on the exact substance. If a value for the exact substance could not be found, then a close structural analog was located and a value was extrapolated to the substance in question. If no primary data or close analog data was available, computer estimation programs were used. All estimated values as well as measured ones are critically reviewed and deemed reasonable based on professional judgement. Studies were excluded from further consideration if they had the following characteristics:

- Lack of reporting data for the pchem property of interest,
- Inadequate reporting of methodology used to measure pchem property,
- Inadequate characterization of the chemical substance of interest, including impurities.

These general criteria were used to identify relevant studies reporting the pchem properties of CCL4.

4.2 Inclusion/Exclusion Criteria for Conditions of Use

Information from sources available to EPA/OPPT, including information reported to EPA/OPPT, trade publications, internet searches, public comments, stakeholder meetings, and public databases, among others, was eligible for inclusion if it provided data or information on:

- Manufacturing, processing, distribution, use or disposal data or relevant information about this chemical,
- Trends in manufacturing (including import) volumes of this chemical,
- Number and location of sites that manufacture, process, distribute, use, recycle, or dispose of this chemical,
- Functional uses for this chemical,
- Which industry sectors use this chemical,
- What concentrations (weight fraction) of this chemical are used in industrial, commercial, and consumer applications,
- What types of products or articles contain this chemical,
- Methods of distribution, e.g. internet sales,
- What volume of this chemical is used for each type of use,
- Which uses have been discontinued or phased out,
- The likelihood that other chemicals will replace this chemical and the names of the other chemicals,¹³

¹³ Information on alternative chemicals sometimes provides useful information for the exposure assessment.

- The likelihood that this chemical will replace other chemicals with similar functional uses, [NOTEREF _Ref483314262 \h * MERGEFORMAT]
- Uses for recycled materials containing this chemical and volume of material recycled,
- Approximate number and description of individuals who can be exposed to this chemical, e.g. industrial workers, commercial workers, high-frequency consumer use, low-frequency consumer use, children,
- The typical setting for uses (e.g. outdoors, indoors, industrial commercial, residential, vehicular).

Data or information not within these characteristics were excluded for further consideration.

4.3 Inclusion/Exclusion Criteria and Tags for Fate, Engineering/Occupational Exposure, Exposure, and Human Health Hazard

Because the searches were designed to be broad, they necessarily returned results that are not on topic for EPA/OPPT's risk evaluations. Based on the information needs identified in Step 1, EPA/OPPT developed specific criteria to determine which references should be tagged as "on-topic" (inclusion criteria) and "off-topic" (exclusion criteria). These were created for each topic area, with gray literature having additional inclusion/exclusion criteria for each source as presented in Section [REF _Ref482714119 \r \h * MERGEFORMAT]. The gray literature source-specific criteria are in Appendix [REF _Ref482713150 \n \h * MERGEFORMAT]. Specific inclusion/exclusion criteria were not developed for the lifecycle/conceptual model search; the search was conducted by engineers with experience developing lifecycle diagrams and conceptual models, and professional judgment was used to determine which resources were on-topic.

Additional sub-categories (or sub-tags) were also included in the tagging structure to allow for additional categorization by source type (e.g., published peer reviewed article versus government report); data type (a primary data source versus a review article or assessment document); topic area (e.g., tagging general population exposure separately from consumer exposure), and chemical-specific and use-specific data or information. These sub-categories are described in Appendix [REF _Ref482713162 \n \h * MERGEFORMAT] and will be used to organize the different streams of evidence during the stages of data evaluation and integration. These steps are not reported in the scope document but will be documented in the draft risk evaluation. Although these sub-categories are discussed in this document, they are not included in the *"Carbon Tetrachloride (CASRN: 56-23-5) Bibliography: Supplemental File for the TSCA Scope Document"* because EPA/OPPT is currently reviewing and refining the results of the categorization, including possible changes to the tagging structure.

4.4 Inclusion/Exclusion Criteria for Fate, Engineering/Occupational Exposure, Exposure, and Human Health Hazard Gray Literature

The gray literature includes a diverse set of sources that were searched using either a manual or automated search technique. The following overall inclusion/exclusion criteria were applied to the gray literature in conjunction with judgment based on subject matter expertise. The ecological search results were assessed using different criteria.

1. General Inclusion Criteria for Gray Literature:

- Quantitative data retrieved from database searches
- Documents that contain quantitative information or assessments of the chemical of interest
- White papers, position papers, regulatory lists, and other information that summarizes how a particular government/agency prioritizes or characterizes the chemical of interest
- Data provided to the Agency by chemical companies and other stakeholders that is publicly available,
- Additional links within the website that link to sites within the same domain/agency
- Information about best practices for remediating or limiting exposure to the chemical

2. General Exclusion Criteria for Gray Literature:

- Documents not available to the public, including information stored within EPA's firewall that is not accessible on the EPA webpage (e.g., TSCA submissions), Confidential Business Information, and information requiring a paid subscription or membership for access
- Links that were broken at the time of the search
- Public comments (usually those without quantitative data) on documents other than the EPA/OPPT existing chemicals dockets
- High level fact sheets and PowerPoint presentations that primarily translate scientific information for the public
- Case studies (primarily occupational exposure) that do not have quantitative information
- Documents that do not explicitly mention the chemical of interest
- FR notices with no quantitative values
- Documents that describe analytical method development but provide no actual measurements useful for characterizing exposure
- Documents captured in searches of other sources
- Researcher CVs and contact information
- Documents reached via a link on the website that are from other government websites
- Landing pages with links, when those links are also captured by the search
- General lists of resources
- Peer-reviewed articles – peer reviewed literature was assumed to be captured in searches of the databases of peer-reviewed literature.
- Draft or earlier versions of documents previously captured
- Duplicate documents (same exact document found in two different result ID's for the same chemical)

These criteria were applied to each gray literature resource, and that application required some judgment. Thus, [REF _Ref483468359 \h][REF _Ref483468366 \h]in Appendix [REF _Ref482713179 \n \h * MERGEFORMAT] provides information specific to that source that indicates how the inclusion and exclusion criteria were interpreted and applied.

4.5 Inclusion/Exclusion Criteria and Tags for Environmental Hazard

On-topic (or applicable) ecological studies obtained through the ECOTOX literature search were required to meet specific acceptability criteria. Additionally, rejection criteria were developed and are documented through ECOTOX codes. Specific details concerning the inclusion/exclusion criteria for ecological studies are included in Appendix [REF _Ref482713196 \n \h * MERGEFORMAT].

5 Step 5: Screen Search Results

5.1 Screening and Tagging for Physical/Chemical Properties

The screening of pchem studies was conducted by an experienced chemist, who applied the inclusion/exclusion criteria when reviewing the title and abstract, and if necessary, the full text, of the studies. Following the identification of relevant studies, the chemist reviewed the quality and acceptability of the studies. The included studies are cited in Section 2.2 and Table 2-1 of the scope document. No tagging was developed or incorporated for the information on pchem properties.

5.2 Screening and Tagging for Conditions of Use

EPA/OPPT screened literature and publicly-available databases, among other sources, to identify information on this chemical's manufacturing, processing, distribution, use, and disposal. Preliminary information was included in the public use document. No tagging was done for this information on conditions of use.

5.3 Screening and Tagging for Fate, Engineering/Occupational Exposure, Exposure, and Human Health Hazard

5.3.1 Peer-Reviewed Literature Database Search Results

Following the database search, the references were imported into DRAGON¹⁴, a database system used to manage aspects of the systematic review process, including literature screening, risk of bias evaluation, and data integration for screening and tagging. DRAGON was used to facilitate the title/abstract screening across a large team. DRAGON allows references to be assigned to different individuals for screening, it allows tracking of the status of screening, and it stores all of the screening decisions. DRAGON does not perform any of the screening; all screening is done manually by trained individuals.

The title and abstract of each reference identified by the literature search was reviewed/screened, by a single reviewer, to determine if the study was *on-topic* or *off-topic*. On-topic references were then tagged, or categorized, using the topic area tags. All individuals who conducted the screening were trained and provided instructions and definitions of tags as shown in Appendix [REF _Ref482713216 \n \h * MERGEFORMAT]. As part of the training process, a senior-level technical expert in the topic area of interest independently reviewed the

¹⁴ EPA/OPPT is in the process of migrating from DRAGON to Distiller for the next steps of the screening process, [HYPERLINK "https://www.icf.com/solutions-and-apps/dragon-online-tool-systematic-review"].

appropriateness of the assigned tags for the first batch of studies reviewed by an individual screener and provided feedback to the screener. Necessary revisions or clarifications to the screening/tagging instructions and definitions were made and circulated to all screeners. Senior-level technical experts also provided feedback and guidance on specific references to the individual screeners as needed during the screening and tagging process. At the conclusion of the title and abstract review for all topic areas, all final tags applied to references were exported from DRAGON and then uploaded into the HERO database.

5.3.2 Gray Literature Search Results

Screening and tagging for the gray literature was performed using Excel to organize and tag the unique search results. Because these types of references generally do not have titles and abstracts, screening and tagging was done on the full text. For references that were searched using the Google API, up to 100 unique results were retrieved for each URL searched. All 100 were then screened to determine if they were *on-topic* or *off-topic*. For references that had to be searched manually, the screener went to each URL and screened all available information for CCL4 on that site, preferentially searching by CAS number.

During a pilot phase of the broad search, each screener tagged 10 references, which were independently reviewed by the senior level technical expert. Discrepancies between the screener and the technical expert were discussed generating specific feedback to the screener before he/she continued with tagging. After the pilot phase, the remaining results were reviewed and tagged according to the tagging structure.

A targeted gray literature search was conducted and an experienced engineer screened the search results to support the development of the initial lifecycle diagram/conceptual models.

5.4 Screening and Tagging for Environmental Hazard

The ECOTOX inclusion/exclusion criteria were used to identify *on-topic* and *off-topic* ecological studies. Reviewers used codes to record the reasons for including or excluding studies. Additional details about the screening and coding procedures can be found in the document "*ECOTOX Literature Searches, Citation, Identification and Skimming*", [[HYPERLINK "https://cfpub.epa.gov/ecotox/blackbox/help/ECOTOXLiteratureSearchesCitationIdentificationandSkimming.pdf"](https://cfpub.epa.gov/ecotox/blackbox/help/ECOTOXLiteratureSearchesCitationIdentificationandSkimming.pdf)].

6 Step 6. Quality Assessment Procedure for Screening and Tagging

Before proceeding with systematic review and data evaluation, EPA/OPPT will assess the specificity and efficiency of the literature searches. Examples of how EPA/OPPT plans to evaluate the performance of the search strategies include:

- Comparison of the references cited in existing EPA/OPPT TSCA problem formulation and risk assessment documents against those identified by the initial search,
- Comparison of the references cited in the public use documents and supporting the life cycle diagrams against those found by the initial search, and
- Comparison of the references cited in review articles.

EPA/OPPT will also assess the performance of the categorization (or tagging) conducted during the title/abstract screening for both the peer-reviewed and gray literature. As a result, some references may move from the *on-topic* to the *off-topic* category, and vice versa. Additional on-topic references could be identified and targeted supplemental searches may be conducted during the analysis phase (e.g., to locate specific information for exposure modeling).

APPENDICES

A. LITERATURE SEARCH INFORMATION NEEDS FOR CARBON TETRACHLORIDE

A-1 Fate Information Needs

Table_Apx [STYLeref 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Fate Information Needs for Carbon Tetrachloride (CCL4)

Objectives	Information Needs
All Objectives	Fate and transport related pchem properties (e.g., octanol-water partition coefficient, organic carbon-water partition coefficient, Henry's Law constant), Bioaccumulation and bioconcentration, biodegradation and metabolism, abiotic degradation (e.g., hydrolysis, photolysis, abiotic reduction), Removal processes in wastewater treatment plants, and Environmental mobility

A-2 Engineering/Occupational Exposure Information Needs

Table_Apx [STYLeref 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Engineering/Occupational Exposure Information Needs for Carbon Tetrachloride (CCL4)

Objectives	Information Needs
All Objectives (including both Occupational Exposure and Environmental Releases)	Description of the life cycle of the chemical(s) of interest, from manufacture to end-of-life (e.g., each manufacturing, processing, or use step), and material flow between the industrial and commercial life cycle stages. The total annual US volume (lb/yr or kg/yr) of the chemical(s) of interest manufactured, imported, processed, and used; and the share of total annual manufacturing and import volume that is processed or used in each life cycle step. Description of processes, equipment, unit operations, and material flows and frequencies (lb/site-day or kg/site-day and days/yr; lb/site-batch and batches/yr) of the chemical(s) of interest during each industrial/ commercial life cycle step. Note: if available, include weight fractions of the chemicals (s) of interest and material flows of all associated primary chemicals (especially water). Basic chemical properties relevant for assessing exposures and releases, e.g., molecular weight, normal boiling point, melting point, physical forms, and room temperature vapor pressure. Number of sites that manufacture, process, or use the chemical(s) of interest for each industrial/ commercial life cycle step and site locations.
Occupational Exposures	Description of worker activities with exposure potential during the manufacture, processing, or use of the chemical(s) of interest in each industrial/commercial life cycle stage. Potential routes of exposure (e.g., inhalation, dermal). Physical form of the chemical(s) of interest for each exposure route (e.g., liquid, vapor, mist) and activity.

	<p>Breathing zone (personal sample) measurements of occupational exposures to the chemical(s) of interest, measured as time-weighted averages (TWAs), short-term exposures, or peak exposures in each occupational life cycle stage (or in a workplace scenario similar to an occupational life cycle stage).</p> <p>Area or stationary measurements of airborne concentrations of the chemical(s) of interest in each occupational setting and life cycle stage (or in a workplace scenario similar to the life cycle stage of interest).</p> <p>For solids, bulk and dust particle size characterization data.</p> <p>Dermal exposure data.</p> <p>Information needs associated with mathematical modeling (will be determined on a case-by-case basis).</p> <p>Exposure duration.</p> <p>Exposure frequency.</p> <p>Number of workers who potentially handle or have exposure to the chemical(s) of interest in each occupational life cycle stage.</p> <p>Personal protective equipment (PPE) types employed by the industries within scope.</p> <p>Engineering controls employed to reduce occupational exposures in each occupational life cycle stage (or in a workplace scenario similar to the life cycle stage of interest), and associated data or estimates of exposure reductions</p>
Environmental Releases	<p>Description of sources of potential environmental releases, including cleaning of residues from process equipment and transport containers, involved during the manufacture, processing, or use of the chemical(s) of interest in each life cycle stage.</p> <p>Estimated mass (lb or kg) of the chemical(s) of interest released from industrial and commercial sites to each environmental medium (air, water, land) and treatment and disposal methods (publicly owned treatment works (POTW), incineration, landfill), including:</p> <ul style="list-style-type: none"> ○ Releases per site and aggregated over all sites; ○ Annual release rates; ○ Daily release rates; ○ Release or emission factors; and ○ Number of release days per year. <p>Information needs associated with mathematical modeling (will be determined on a case-by-case basis).</p> <p>Waste treatment methods and pollution control devices employed by the industries within scope and associated data on release/emission reductions.</p>

A-3 Exposure Information Needs

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Exposure Information Needs for Carbon Tetrachloride (CCL4)

Objectives	Information Needs
Lifecycle, general population, and consumer exposures	<p>What products contain this chemical?</p> <p>What articles contain this chemical?</p> <p>How are products/articles typically disposed of?</p> <p>What are the use patterns/frequencies for different age groups for the products/articles?</p> <p>Are there existing assessments (including modeled data) looking at exposure to the general population?</p> <p>Are there existing assessments (including modeled data) looking at exposure to consumers?</p> <p>What specific activities have the potential for consumer exposures to chemicals?</p> <p>What are the likely routes of exposure?</p> <p>What are the number of consumers potentially exposed?</p> <p>Are any modeled exposures available?</p>

Presence in the environment/ Biomonitoring data	<p>Is there monitoring data for the concentration of this chemical in:</p> <ul style="list-style-type: none"> ○ Foods, either individually or as a "market basket" ○ Drinking water in the United States, either from well water or public drinking water sources ○ Ambient Air ○ Indoor Air ○ Indoor Dust ○ Soil ○ Wastewater/sludge ○ Sediment ○ Plant life/crops/biota ○ Terrestrial Wildlife/livestock/fish/ aquatic wildlife ○ Blood (for US populations) ○ Urine (for US populations) ○ Cord blood (for US populations) ○ Human tissues (for US populations)
Environmental Releases	<p>Are there documented populations near manufacturing facilities or in other hot spots receiving higher-than-average exposure?</p> <p>Is there chemical-specific emission rate data for the products/articles containing the chemical?</p>

A-4 Human Health Information Needs

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Human Health Information Needs for Carbon Tetrachloride (CCL4)

Objectives	Information Needs
Overall Objectives	<ul style="list-style-type: none"> • Identify and document all health hazards associated with exposure to the chemical via all relevant routes, durations and sources/pathways of exposure, using hazard data from: <ul style="list-style-type: none"> ○ Animal and human (epidemiological and experimental) studies ○ Acute/immediate effects, delayed acute effects, chronic/long-term effects • Identify critical health effect(s) such as acute effects, low-dose effects and/or severe effects (e.g., cancer, non-cancer target organ effects, reproductive/developmental effects) <ul style="list-style-type: none"> ○ Identify key studies for critical effect(s) ○ Identify dose (or concentration)-response data • Identify points of departures (PODs) for critical effect(s) for each relevant exposure route (e.g., inhalation, oral, dermal) and exposure duration (e.g., acute, sub chronic and chronic)
Toxicokinetics	<ul style="list-style-type: none"> • Identify toxicokinetic data, i.e. on absorption, distribution, metabolism, excretion (ADME): <ul style="list-style-type: none"> ○ Animal and human studies

	<ul style="list-style-type: none"> ○ <i>In vitro</i> studies ○ Modelled ADME data ○ Physiologically-based pharmacokinetic (PBPK) models
Mode of Action (MOA)	<ul style="list-style-type: none"> ● Identify studies that support a MOA for critical effects e.g., for threshold or non-threshold cancer and non-cancer effects from: <ul style="list-style-type: none"> ○ <i>In vitro</i> mechanistic studies ○ Genotoxicity studies ○ <i>In vivo</i> mechanistic studies ○ Experimental studies in humans ○ Studies that link exposure to a carcinogenic effect
Occupational Exposures	<ul style="list-style-type: none"> ● Characterization of health effects associated with occupational exposures: <ul style="list-style-type: none"> ○ Health effects associated with various exposure routes and/or physical forms of the chemical ○ For solid dusts – differences in health effects associated with particle size fraction
Potentially Exposed and Susceptible Subpopulations	<ul style="list-style-type: none"> ● Characterization of factors that may make humans more vulnerable to develop adverse effects

B. DATABASE (PEER-REVIEWED) LITERATURE SEARCHES FOR FATE, ENGINEERING/OCCUPATIONAL EXPOSURE, EXPOSURE, AND HUMAN HEALTH HAZARD

B-1 Carbon Tetrachloride (CCL4) Synonyms

These are the synonyms of CCL4 that were considered during the development of the database searches for fate, engineering, exposure and human health hazard information.

- | | |
|---|--|
| <ul style="list-style-type: none"> ● Carbon Tetrachloride ● 56-23-5 ● CCl₄ ● 1,1,1,1-Tetrachloromethane ● Benzinoform ● Carbona ● Carbon Chloride ● Carbon Tet ● CC m0 ● Czterochlorek Wegla (Polish) ● Ent 4,705 ● Pesticide Code: 016501 ● Fasciolin ● Flukoids ● Freon 10 ● Halon 104 ● Methane Tetrachloride* (CAS Inventory Name) ● Methane, tetrachloro- | <ul style="list-style-type: none"> ● Necatorina ● Necatorine ● NSC 97063 ● Perchloromethane ● Phenixin ● Phenoxin ● R 10 ● Tetrachloorkoolstof (Dutch) ● Tetrachloormetaan ● Tetrachlorkohlenstoff, Tetra (German) ● Tetrachlorocarbon ● Tetrachloromethane ● Tetrachlorure de carbone (French) ● Tetraclorometano (Italian) ● Tetracloruro de carbonio (Italian) |
|---|--|

- Tetraffinol
- Tetraform
- Tetrasol
- Univerm
- Vermoestricid

Literature Search Strategies for Database Literature Searches for Fate,
Engineering/Occupational Exposure, and Exposure

**Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Carbon Tetrachloride (CCL4)
Fate, Engineering/Occupational Exposure, and Exposure Search Strategy for Web of Science**

Search	Search Strategy
Chemical Terms*	(1,1,1,1-Tetrachloromethane OR Benzinoform OR Carbon-Tet OR CC-m0 OR Czerochlorek-Wegla OR Flukoids OR Freon-10 OR Halon-104 OR Methane-Tetrachloride OR Necatorina OR Necatorine OR NSC-97063 OR Phenoxin OR Tetrachloorkoolstof OR Tetrachloormetaan OR Tetrachlorure-de-carbone OR Tetraclorometano OR Tetracloruro-de-carbonio OR Tetraffinol OR Tetraform OR Vermoestricid OR 56-23-5 OR Carbona OR Carbon-Chloride OR Carbon-Tetrachloride OR CCl4 OR Ent-4,705 OR Fasciolin OR Methane,-tetrachloro OR Perchloromethane OR Phenixin OR Tetrachlorkohlenstoff,-Tetra OR Tetrachlorocarbon OR Tetrachloromethane OR Tetrasol OR Univerm)
Use Terms	AND ((waterless-shampoo* OR Additive* OR Adhesive OR adhesives OR aerosol-carriers OR asphalt OR benzyl resin OR bitumens OR bonder* OR bonding OR calibrat* OR catalyst-regenerator OR catalyst-regenerators OR chelat* OR chlorinated-rubber OR clean* OR Coating OR diluent OR ethylcellulose OR extract* OR fire-extinguisher* OR grain-fumigant* OR gums OR infared-spectroscopy OR intermediate OR lubricant OR lubricants OR metalorganic-vapor-phase-epitaxy OR nuclear-magnetic-resonance OR Paint* OR Paste* OR petrol OR pyrosulfuryl chloride OR reactive-ion-etching OR recovery OR Reference-material* OR refining OR refrigerant OR refrigerants OR remover* OR rosin OR scrubbing OR Semiconductor* OR synthesis-agent OR synthesis-agents OR Synthetic-rubber OR tail-gas OR Tape OR tetrabromomethane OR textile* OR Wire-insulation) OR ((OECD AND Guideline*) OR (OPPTS AND guideline*) OR (OCSPP AND Guideline*) OR abiotic OR absorb OR absorption OR accumulation-rate OR activi* OR adipose OR adsorp* OR aerob* OR aerosol OR aerosols OR aged OR aggregate OR air OR amount-used OR anaerob* OR analy* OR anoxic OR area-source OR atm-m3/mol OR automotive OR BAF OR BCF OR bioaccumulat* OR bioavail* OR bioconcentrat* OR biodegrad* OR biomagnification OR biomoni* OR biosolids OR biota OR biotrans* OR breakdown-product OR breakdown-products OR breastmilk OR breast-milk OR breathing-zone OR brush-applied OR BSAF OR BSAFs OR building-envelope OR chamber OR chelation OR children OR coagulation OR coating OR commercial OR complexation OR conc* OR consumer OR contamination OR controls OR crawling OR creatinine OR cultural OR cumulative OR decay-rate OR degrad* OR degreaser OR dermal OR detect OR diffusion-coefficient OR disadvantaged OR disease OR dispers* OR disposal OR dissolution OR distribution OR diy OR do-it-yourself OR dose OR drinking-water OR dust OR education-level OR effluent OR elderly OR emission OR emissions OR engineering-controls OR English-as-a-second-language OR environmental-fate OR environmental-justice OR ethnicity OR evaporation-from-water OR excretion OR exposure OR facili* OR Female OR Females OR fence-line-population OR fetal OR fetus OR fish* OR flocculation OR flux OR formula OR fugacity OR garage OR gas-phase-mass-transfer OR gender OR general-population OR genetic-polymorphism OR genetic-traits OR geography OR geophag* OR geriatric OR German-human-biomonitoring-values OR groundwater OR ground-water OR guns OR half-life OR hand-to-mouth OR health-status OR henry's-law OR hobb* OR homeless OR hydroly* OR illegal-immigrants OR immunocompromised OR import* OR incinerate OR incineration OR income OR indigenous OR indoor-outdoor-ratio OR industrial OR infants OR influent OR ingestion OR inhal* OR intake OR inter-individual OR inter-zonal-air-flow OR intra-individual OR KAW OR Kd OR kinetics OR KOA OR KOC OR lacquer OR lactat* OR landfill OR landfills OR leach* OR lifecycle OR life-cycle OR lifestage OR life-stage OR lifestages OR life-stages OR lifestyle OR liquid-phase-mass-transfer OR loading OR Male OR males OR manuf* OR mass-transfer-coefficient OR menopaus* OR metaboli* OR microcosm OR migrat* OR modified-state-space OR
Exposure, Engineering, & Fate Terms	

Search	Search Strategy
	<p>monitoring OR mouthing OR near-facility-population OR nutrition-status OR occupa* OR occur OR occurrence OR OCSPP OR ocular OR older-adults OR on-site-treatment OR oral OR overspray-fraction OR partic* OR particle-size OR particulate OR partition* OR pathway OR pathways OR penetration-factor OR penetration-ratio OR perinatal OR persisten* OR personal OR photoly* OR photostability OR pica OR placenta OR plasma OR plume OR PM-10 OR PM-2.5 OR point-source OR point-sources OR pore-water OR postnatal OR POTW OR PPE OR preexisting-disease OR pregnan* OR prenatal OR preparedness OR pretreatment-program OR process* OR product OR protective OR proximity OR race OR recover* OR recreation* OR recycling OR redox OR release OR releases OR remed* OR residential OR residual OR rolled OR route OR routes OR rural OR sample OR samples OR school-age* OR sediment OR senior OR seniors OR sensitiv* OR serum OR SES OR sewage-treatment OR short-term OR shower* OR single-parent OR single-parents OR sink OR sinks OR site OR sites OR skin OR sludge OR socioeconomic-status OR soil OR solvent OR solvents OR sorb* OR sorp* OR source OR sources OR spray-applied OR stress* OR subpopulation OR subsistence OR subsurface-intrusion OR Superfund OR surface-water-concentration OR susceptib* OR time-weighted-average OR toddler OR toddlers OR transfer OR transformation OR tribal OR trophic-magnification OR urban OR urine OR use OR uses OR vapor OR ventilat* OR volatil* OR volume OR vulnerab* OR wait-time OR wastewater-treatment OR water OR weight-fraction OR wildlife OR wipe OR women-of-childbearing-age OR Worker OR workers OR workplace OR WWTP OR young))</p>
Limits	<ul style="list-style-type: none"> Refined by: RESEARCH AREAS: (AGRICULTURE OR MARINE FRESHWATER BIOLOGY OR PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH OR MATERIALS SCIENCE OR CONSTRUCTION BUILDING TECHNOLOGY OR METEOROLOGY ATMOSPHERIC SCIENCES OR MINING MINERAL PROCESSING OR ENGINEERING OR ENVIRONMENTAL SCIENCES ECOLOGY OR FISHERIES OR WATER RESOURCES OR ZOOLOGY OR GEOCHEMISTRY GEOPHYSICS) Indexes=SCI-EXPANDED, SSCI
Date of Search: 2/20/2017	

*Synonyms not found in Web of Science were removed from search string

B-2 Literature Search Strategies for Database Literature Searches for Human Health

Table_Apx [STYLeref 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Carbon Tetrachloride (CCL4) Human Health Hazard Peer-Reviewed Literature Search Strategy

Search	Search Strategy
	Pub Med¹
Chemical Terms	(56-23-5[rn] OR Carbona[tiab] OR Carbon-Chloride[tiab] OR Carbon-Tetrachloride[tiab] OR Carbon-Tetrachloride[mh] OR CCl4[tiab] OR Ent-4,705[tiab] OR Fasciolin[tiab] OR Methane,-tetrachloro[tiab] OR Perchloromethane[tiab] OR Phenixin[tiab] OR Tetrachlorkohlenstoff,-Tetra[tiab] OR Tetrachlorocarbon[tiab] OR Tetrachloromethane[tiab] OR Tetrasol[tiab] OR Univerm[tiab])
Health Effect Terms	AND ((DNA[tiab] AND breaks[tiab]) OR absorption[tiab] OR absorption[mh] OR activate[tiab] OR activated[tiab] OR acute[tiab] OR adverse[tiab] OR adverse-effects[sh] OR Ames-assay[tiab] OR Ames-test[tiab] OR animal[tiab] OR blood[tiab] OR blood[mh] OR brain[mh] OR brain[tiab] OR cancer[tiab] OR carcinogen[tiab] OR carcinogenesis[tiab] OR carcinogenic[tiab] OR carcinogenicity[tiab] OR carcinogens[tiab] OR carcinogens[mh] OR cardiac[tiab] OR case-control[tiab] OR case-control-studies[mh] OR case-referent[tiab] OR case-report[tiab] OR case-reports[tiab] OR case-reports[pt] OR cell[tiab] OR cell-proliferation[mh] OR cells[tiab] OR cells[mh] OR chemokine[tiab] OR chemokines[tiab] OR chromosomal-aberration[tiab] OR chromosomal-aberration[tiab] OR chromosomal-aberrations[tiab] OR chromosomal-aberrations[mh] OR chronic[tiab] OR cognitive[tiab] OR cohort[tiab] OR cohort-studies[mh] OR congenital-abnormalities[mh] OR corrosion[mh] OR corrosion[tiab] OR crosslink[tiab] OR cytogenicity[tiab] OR cytokine[tiab] OR cytokines[tiab] OR cytokines[mh] OR cytotoxic[tiab] OR cytotoxicity[tiab] OR dam[tiab] OR dams[tiab] OR death[mh] OR death[tiab] OR dermal[tiab] OR detoxification[tiab] OR detoxify[tiab] OR development[tiab] OR developmental[tiab] OR diet[mh] OR diet[tiab] OR dietary[tiab] OR diets[tiab] OR distribution[tiab] OR DNA-adduct[tiab] OR DNA-adducts[mh] OR DNA-adducts[tiab] OR DNA-breaks[mh] OR DNA-damage[mh] OR DNA-damage[tiab] OR DNA-repair[mh] OR DNA-repair[tiab] OR dog[tiab] OR dogs[tiab] OR dogs[mh] OR dose[tiab] OR drinking-water[tiab] OR drinking-water[mh] OR eliminate[tiab] OR elimination[tiab] OR embryo[tiab] OR embryonic[tiab] OR embryos[tiab] OR employee[tiab] OR employees[tiab] OR endocrine[tiab] OR endpoint[tiab] OR endpoints[tiab] OR enteral-nutrition[mh] OR epidemiologic[tiab] OR epidemiological[tiab] OR epidemiology[mh] OR epidemiology[sh] OR epidemiology[tiab] OR epigenetic[tiab] OR epigenetics[tiab] OR epigenomics[tiab] OR epigenomics[mh] OR female[tiab] OR females[tiab] OR fetal[tiab] OR fetus[tiab] OR fetus[mh] OR fetuses[tiab] OR gavage[tiab] OR Gene[tiab] OR gene-expression[mh] OR genes[tiab] OR genes[mh] OR genetic[tiab] OR genetics[tiab] OR genotoxic[tiab] OR genotoxicity[tiab] OR germ-line-mutation[tiab] OR germ-line-mutation[mh] OR growth-and-development[mh] OR guinea-pig[tiab] OR guinea-pigs[tiab] OR guinea-pigs[mh] OR hamster[tiab] OR hamsters[tiab] OR hazard[tiab] OR heart[tiab] OR heart[mh] OR hemotoxic[tiab] OR hemotoxicity[tiab] OR hemotoxin[tiab] OR hemotoxins[tiab] OR hepatic[tiab] OR hepatotoxic[tiab] OR hepatotoxicity[tiab] OR hepatotoxin[tiab] OR hepatotoxins[tiab] OR human[tiab] OR humans[tiab] OR humans[mh] OR immunotoxic[tiab] OR immunotoxicity[tiab] OR immunotoxin[tiab] OR immunotoxins[tiab] OR immunotoxins[mh] OR incidence[tiab] OR incidences[tiab] OR individual[tiab] OR individuals[tiab] OR inflammation[tiab] OR inflammation[mh] OR inflammatory[tiab] OR inhalation[tiab] OR inhalation[mh] OR inhale[tiab] OR inhaled[tiab] OR inhibit[tiab] OR inhibited[tiab] OR inhibitory[tiab] OR interact[tiab] OR interacted[tiab] OR interaction[tiab] OR intestine[tiab] OR intestines[tiab] OR intestines[mh] OR in-vitro[tiab] OR in-vitro-techniques[mh] OR in-vivo[tiab] OR irritation[tiab] OR kidney[tiab] OR kidney[mh] OR LC50[tiab] OR LD50[tiab] OR lethal-

Search	Search Strategy
	<p>concentration-50[tiab] OR Lethal-Dose-50[tiab] OR Lethal-Dose-50[mh] OR litter[tiab] OR litters[tiab] OR liver[tiab] OR liver[mh] OR LOAEC[tiab] OR LOAEL[tiab] OR LOEL[tiab] OR longitudinal[tiab] OR long-term-adverse-effects[mh] OR lung[tiab] OR lung[mh] OR male[tiab] OR malformation[tiab] OR malformations[tiab] OR malformed[tiab] OR malignancies[tiab] OR malignancy[tiab] OR malignant[tiab] OR margin-of-exposure[tiab] OR maternal[tiab] OR mechanism[tiab] OR mechanisms[tiab] OR mechanistic[tiab] OR metabolism[tiab] OR metabolism[mh] OR metabolism[sh] OR metastasis[tiab] OR metastasize[tiab] OR metastatic[tiab] OR mg/kg/day[tiab] OR mg/kg-bw/day[tiab] OR mg/L[tiab] OR mg/m3[tiab] OR mg-kg/day[tiab] OR mice[mh] OR mice[tiab] OR micronuclei[tiab] OR micronucleus[tiab] OR mode-of-action[tiab] OR monkey[tiab] OR monkeys[tiab] OR mortality[mh] OR mortality[tiab] OR mouse[tiab] OR mouth[tiab] OR mouth[mh] OR mutagen[tiab] OR mutagenesis[tiab] OR mutagenic[tiab] OR mutagens[mh] OR mutagens[tiab] OR mutation[tiab] OR mutation[mh] OR nasal[tiab] OR neoplasm[tiab] OR neoplasms[tiab] OR neoplasms[mh] OR neoplastic[tiab] OR nephrotoxic[tiab] OR nephrotoxicity[tiab] OR nephrotoxin[tiab] OR nephrotoxins[tiab] OR nested[tiab] OR neurobehavior[tiab] OR neurobehavioral[tiab] OR neurologic[tiab] OR neurological[tiab] OR neuropsychological[tiab] OR neuropsychological[tiab] OR neurotoxic[tiab] OR neurotoxicity[tiab] OR neurotoxin[tiab] OR neurotoxins[tiab] OR neurotoxins[mh] OR NOAEC[tiab] OR NOAEL[tiab] OR NOEL[tiab] OR nonmalignant[tiab] OR nonneoplastic[tiab] OR nose[tiab] OR nose[mh] OR OECD-Test-Guideline[tiab] OR OECD-Test-Guidelines[tiab] OR oncogene[tiab] OR oncogenes[tiab] OR oncogenes[mh] OR oncogenesis[tiab] OR oral[tiab] OR organ[tiab] OR organs[tiab] OR ototoxic[tiab] OR ototoxicity[tiab] OR oxidative-damage[tiab] OR oxidative-stress[tiab] OR oxidative-stress[mh] OR participant[tiab] OR participants[tiab] OR paternal[tiab] OR PBPK[tiab] OR people[tiab] OR perinatal[tiab] OR person[tiab] OR pharmacodynamic[tiab] OR pharmacodynamics[tiab] OR pharmacokinetic[tiab] OR pharmacokinetics[mh] OR pharmacokinetics[tiab] OR pharmacokinetics[sh] OR pharmacology[sh] OR pharmacology[mh] OR pharmacology[tiab] OR polyploid[tiab] OR polyploidy[tiab] OR polyploidy[mh] OR postnatal[tiab] OR pregnancy[mh] OR pregnancy[tiab] OR pregnancy-complications[mh] OR pregnant[tiab] OR prenatal[tiab] OR prevalence[tiab] OR prevalent[tiab] OR promote[tiab] OR promotion[tiab] OR pulmonary[tiab] OR rabbit[tiab] OR rabbits[tiab] OR rabbits[mh] OR rat[tiab] OR rats[mh] OR rats[tiab] OR registries[mh] OR registries[tiab] OR registry[tiab] OR renal[tiab] OR reproduction[tiab] OR reproduction[mh] OR reproductive[tiab] OR reprotoxic[tiab] OR reprotoxicity[tiab] OR respiration[mh] OR respiration[tiab] OR respiratory[tiab] OR rodent[tiab] OR rodents[tiab] OR SCE[tiab] OR sensitization[tiab] OR sensitized[tiab] OR sensitizer[tiab] OR sensitizing[tiab] OR sister-chromatid-exchange[mh] OR sister-chromatid-exchange[tiab] OR skeletal[tiab] OR skin[tiab] OR skin[mh] OR subchronic[tiab] OR sub-chronic[tiab] OR subject[tiab] OR subjects[tiab] OR systemic[tiab] OR teratogen[tiab] OR teratogenic[tiab] OR teratogens[tiab] OR teratogens[mh] OR toxic[tiab] OR toxicant[tiab] OR toxicants[tiab] OR toxicity[sh] OR Toxicity[tiab] OR Toxicity[sh] OR toxicodynamic[tiab] OR toxicodynamics[tiab] OR toxicokinetic[tiab] OR toxicokinetics[tiab] OR toxicokinetics[mh] OR toxicology[mh] OR toxicology[tiab] OR tumor[tiab] OR tumorigenic[tiab] OR tumors[tiab] OR weight[tiab] OR worker[tiab] OR workers[tiab] OR Adolescen*[tiab] OR Adult*[tiab] OR Age[tiab] OR aged[tiab] OR age-groups[mh] OR ages[tiab] OR Alcohol[tiab] OR At-risk[tiab] OR BMI[tiab] OR body-mass-index[tiab] OR body-mass-index[mh] OR boy[tiab] OR boys[tiab] OR child[tiab] OR children[tiab] OR cigar[tiab] OR Cigarette[tiab] OR cigarettes[tiab] OR cigars[tiab] OR Coexposure[tiab] OR co-exposure[tiab] OR Critical-window*[tiab] OR Diabetes[tiab] OR diabetes-insipidus[mh] OR diabetes-mellitus[mh] OR disadvantaged[tiab] OR Early-life[tiab] OR Elderly[tiab] OR Environmental-justice[tiab] OR Ethanol[tiab] OR Ethnic[tiab] OR ethnic-groups[mh] OR ethnicit*[tiab] OR Females[tiab] OR gastrointestinal-microbiome[mh] OR Gender[tiab] OR Genotype[tiab] OR genotype[mh] OR Genotypes[tiab] OR genotypic[tiab] OR Geriatric[tiab] OR gestation[tiab] OR gestational[tiab] OR girl[tiab] OR girls[tiab] OR Gut[tiab] OR Haplotype[tiab] OR</p>

Search	Search Strategy
	Haplotypes[tiab] OR haplotypes[mh] OR Health-status[mh] OR Health-status[tiab] OR Inequalit*[tiab] OR Inequit*[tiab] OR infancy[tiab] OR infant[tiab] OR infants[tiab] OR In-utero[tiab] OR lifestage[tiab] OR Life-stage[tiab] OR lifestages[tiab] OR Life-stages[tiab] OR Males[tiab] OR Men[mh] OR Men[tiab] OR Metagenomic[tiab] OR metagenomics[tiab] OR metagenomics[mh] OR methylation[mh] OR Methylation[tiab] OR Microbiome[tiab] OR Microbiomes[tiab] OR Microbiota[tiab] OR minorities[tiab] OR minorities[tiab] OR Minority[tiab] OR minority-groups[mh] OR Modifying-factor[tiab] OR Modifying-factors[tiab] OR natal[tiab] OR newborn[tiab] OR newborns[tiab] OR Nicotine[tiab] OR nicotine[mh] OR nutritional-status[mh] OR nutritional-status[tiab] OR placenta[mh] OR placenta[tiab] OR placental[tiab] OR Polymorphism[tiab] OR polymorphism,-genetic[mh] OR polymorphisms[tiab] OR poverty[mh] OR Poverty[tiab] OR Preexisting[tiab] OR pre-existing[tiab] OR pregnant-women[mh] OR Preschool[tiab] OR preschooler[tiab] OR preschoolers[tiab] OR Race[tiab] OR Racial[tiab] OR racism[mh] OR racism[tiab] OR Sensitive-population[tiab] OR Sensitive-populations[tiab] OR SES[tiab] OR sex[mh] OR Sex[tiab] OR smoke[tiab] OR Smoke[mh] OR smoker[tiab] OR smokers[tiab] OR smoking[tiab] OR smoking[mh] OR Sociocultural[tiab] OR sociodemographic[tiab] OR Socioeconomic[tiab] OR socio-economic[tiab] OR socioeconomic-factors[mh] OR Susceptibilities[tiab] OR Susceptibility[tiab] OR Susceptible[tiab] OR teenager[tiab] OR teenagers[tiab] OR teens[tiab] OR Tobacco[tiab] OR tobacco-products[mh] OR toddler[tiab] OR toddlers[tiab] OR underserved[tiab] OR Vulnerabilities[tiab] OR Vulnerability[tiab] OR Vulnerable[tiab] OR vulnerable-populations[mh] OR Women[mh] OR Women[tiab] OR cardiovascular[tiab])
Limits	2009 to present
Date of Search: 3/1/2017	
Web of Science ²	
Chemical Terms	(1,1,1,1-Tetrachloromethane OR Benzinoform OR Carbon-Tet OR CC-m0 OR Czterochlorek-Wegla OR Flukoids OR Freon-10 OR Halon-104 OR Methane-Tetrachloride OR Necatorina OR Necatorine OR NSC-97063 OR Phenoxin OR Tetrachloorkoolstof OR Tetrachloormetaan OR Tetrachlorure-de-carbone OR Tetraclorometano OR Tetracloruro-de-carbonio OR Tetraffinol OR Tetraform OR Vermoestricid OR 56-23-5 OR Carbona OR Carbon-Chloride OR Carbon-Tetrachloride OR CCl4 OR Ent-4,705 OR Fasciolin OR Methane,-tetrachloro OR Perchloromethane OR Phenixin OR Tetrachlorkohlenstoff,-Tetra OR Tetrachlorocarbon OR Tetrachloromethane OR Tetrasol OR Univerm)
Health Effect Terms	AND ((DNA AND breaks) OR absorption OR activate OR activated OR acute OR adverse OR Ames-assay OR Ames-test OR animal OR blood OR brain OR cancer OR carcinogen OR carcinogenesis OR carcinogenic OR carcinogenicity OR carcinogens OR cardiac OR case-control OR case-referent OR case-report OR case-reports OR cell OR cells OR chemokine OR chemokines OR chromosomal-aberration OR chromosomal-aberration OR chromosomal-aberrations OR chronic OR cognitive OR cohort OR corrosion OR crosslink OR cytogenicity OR cytokine OR cytokines OR cytotoxic OR cytotoxicity OR dam OR dams OR death OR dermal OR detoxification OR detoxify OR development OR developmental OR diet OR dietary OR diets OR distribution OR DNA-adduct OR DNA-adducts OR DNA-damage OR DNA-repair OR dog OR dogs OR dose OR drinking-water OR eliminate OR elimination OR embryo OR embryonic OR embryos OR employee OR employees OR endocrine OR endpoint OR endpoints OR epidemiologic OR epidemiological OR epidemiology OR epigenetic OR epigenetics OR epigenomics OR female OR females OR fetal OR fetus OR fetuses OR gavage OR Gene OR genes OR genetic OR genetics OR genotoxic OR genotoxicity OR germ-line-mutation OR guinea-pig OR guinea-pigs OR hamster OR hamsters OR hazard OR heart OR hemotoxic OR hemotoxicity OR hemotoxin OR hemotoxins OR hepatic OR hepatotoxic OR hepatotoxicity OR hepatotoxin OR hepatotoxins OR human OR humans OR immunotoxic OR immunotoxicity OR immunotoxin OR immunotoxins OR incidence OR incidences OR individual OR individuals OR inflammation OR inflammatory OR inhalation OR inhale OR inhaled OR inhibit OR

Search	Search Strategy
	<p>inhibited OR inhibitory OR interact OR interacted OR interaction OR intestine OR intestines OR in-vitro OR in-vivo OR irritation OR kidney OR LC50 OR LD50 OR lethal-concentration-50 OR Lethal-Dose-50 OR litter OR litters OR liver OR LOAEC OR LOAEL OR LOEL OR longitudinal OR lung OR male OR malformation OR malformations OR malformed OR malignancies OR malignancy OR malignant OR margin-of-exposure OR maternal OR mechanism OR mechanisms OR mechanistic OR metabolism OR metastasis OR metastasize OR metastatic OR mg/kg/day OR mg/kg-bw/day OR mg/L OR mg/m3 OR mg-kg/day OR mice OR micronuclei OR micronucleus OR mode-of-action OR monkey OR monkeys OR mortality OR mouse OR mouth OR mutagen OR mutagenesis OR mutagenic OR mutagens OR mutation OR nasal OR neoplasm OR neoplasms OR neoplastic OR nephrotoxic OR nephrotoxicity OR nephrotoxin OR nephrotoxins OR nested OR neurobehavior OR neurobehavioral OR neurologic OR neurological OR neurophysiological OR neuropsychological OR neurotoxic OR neurotoxicity OR neurotoxin OR neurotoxins OR NOAEC OR NOAEL OR NOEL OR nonmalignant OR nonneoplastic OR nose OR OECD-Test-Guideline OR OECD-Test-Guidelines OR oncogene OR oncogenes OR oncogenesis OR oral OR organ OR organs OR ototoxic OR ototoxicity OR oxidative-damage OR oxidative-stress OR participant OR participants OR paternal OR PBPK OR people OR perinatal OR person OR pharmacodynamic OR pharmacodynamics OR pharmacokinetic OR pharmacokinetics OR pharmacology OR polyploid OR polyploidy OR postnatal OR pregnancy OR pregnant OR prenatal OR prevalence OR prevalent OR promote OR promotion OR pulmonary OR rabbit OR rabbits OR rat OR rats OR registries OR registry OR renal OR reproduction OR reproductive OR reprotoxic OR reprotoxicity OR respiration OR respiratory OR rodent OR rodents OR SCE OR sensitization OR sensitized OR sensitizer OR sensitizing OR sister-chromatid-exchange OR skeletal OR skin OR subchronic OR sub-chronic OR subject OR subjects OR systemic OR teratogen OR teratogenic OR teratogens OR toxic OR toxicant OR toxicants OR Toxicity OR toxicodynamic OR toxicodynamics OR toxicokinetic OR toxicokinetics OR toxicology OR tumor OR tumorigenic OR tumors OR weight OR worker OR workers OR Adolescen* OR Adult* OR Age OR aged OR ages OR Alcohol OR At-risk OR BMI OR body-mass-index OR boy OR boys OR child OR children OR cigar OR Cigarette OR cigarettes OR cigars OR Coexposure OR co-exposure OR Critical-window* OR Diabetes OR disadvantaged OR Early-life OR Elderly OR Environmental-justice OR Ethanol OR Ethnic OR ethnicit* OR Females OR Gender OR Genotype OR Genotypes OR genotypic OR Geriatric OR gestation OR gestational OR girl OR girls OR Gut OR Haplotype OR Haplotypes OR Health-status OR Inequalit* OR Inequit* OR infancy OR infant OR infants OR In-utero OR lifestage OR Life-stage OR lifestages OR Life-stages OR Males OR Men OR Metagenomic OR metagenomics OR Methylation OR Microbiome OR Microbiomes OR Microbiota OR minorities OR minorities OR Minority OR Modifying-factor OR Modifying-factors OR natal OR newborn OR newborns OR Nicotine OR nutritional-status OR placenta OR placental OR Polymorphism OR polymorphisms OR Poverty OR Preexisting OR pre-existing OR Preschool OR preschooler OR preschoolers OR Race OR Racial OR racism OR Sensitive-population OR Sensitive-populations OR SES OR Sex OR smoke OR smoker OR smokers OR smoking OR Sociocultural OR sociodemographic OR Socioeconomic OR socio-economic OR Susceptibilities OR Susceptibility OR Susceptible OR teenager OR teenagers OR teens OR Tobacco OR toddler OR toddlers OR underserved OR Vulnerabilities OR Vulnerability OR Vulnerable OR Women OR cardiovascular)</p>
Limits	<ul style="list-style-type: none"> • 2009 to present • Refined by: RESEARCH AREAS: (GASTROENTEROLOGY HEPATOLOGY OR GENERAL INTERNAL MEDICINE OR ALLERGY OR ANATOMY MORPHOLOGY OR OTORHINOLARYNGOLOGY OR PATHOLOGY OR HEMATOLOGY OR PEDIATRICS OR IMMUNOLOGY OR PHARMACOLOGY PHARMACY OR BEHAVIORAL SCIENCES OR INFECTIOUS DISEASES OR BIOCHEMISTRY MOLECULAR BIOLOGY OR CARDIOVASCULAR SYSTEM CARDIOLOGY OR PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH OR CELL BIOLOGY OR MATHEMATICAL COMPUTATIONAL BIOLOGY OR REPRODUCTIVE BIOLOGY OR RESPIRATORY SYSTEM OR DERMATOLOGY

Search	Search Strategy
	OR DEVELOPMENTAL BIOLOGY OR ENDOCRINOLOGY METABOLISM OR TOXICOLOGY OR NEUROSCIENCES NEUROLOGY OR UROLOGY NEPHROLOGY OR NUTRITION DIETETICS OR VETERINARY SCIENCES OR ONCOLOGY) <ul style="list-style-type: none"> • Indexes=SCI-EXPANDED, SSCI
Date of Search: 3/1/2017	
Toxline ³	
Chemical Terms	(56-23-5)
Health Effect Terms	Identical to Web of Science Health Effect Terms
Limits	<ul style="list-style-type: none"> • 2009 to present • Include CASRNs and synonyms • Exclude PubMed records
Date of Search: 3/1/2017	

¹ Synonyms not found in PubMed were removed from consideration in the search; [mh] searched in MeSH field; [tiab] searched in title or abstract fields; [sh] searched in subheading field.

² Synonyms not found in Web of Science were removed from consideration in the search.

³ Synonyms searched automatically

C. GRAY LITERATURE SEARCHES FOR FATE, ENGINEERING/OCCUPATIONAL EXPOSURE, EXPOSURE, AND HUMAN HEALTH HAZARD

The gray literature search for fate, engineering, exposure, and human health hazard was done with a goal of efficiency. For this reason, websites were automatically searched wherever possible. After creating the list of sites to search, three categories of websites were identified that required a different search strategy as explained below.

- *Websites that can be effectively searched using Google:* these websites and corresponding subsites have relevant documents that can be searched using Google. EPA/OPPT used Google's API that allows the user to create custom searches restricted by both keyword list and URL list. This approach greatly increased the speed of the searches, since code was written to implement the searches automatically. The following key restrictions, however, were encountered during the search:
 - The API returns the first 100 sites found, after sorting for predicted relevancy. As with all Google searches, Google attempts to rank the returned URLs in terms of overall relevancy to the search terms. However, if 3,600 sites are returned by the search, only the first 100 according to Google's ranked order are returned.
 - The search strings in Google and the Google API are restricted to 128 characters. For carbon tetrachloride, the following search string was created to have the maximum number of chemical synonyms/CAS numbers without exceeding 128 characters: "56-23-5" OR "Carbon-Tetrachloride" OR "Carbon-Chloride" OR "CCl4" OR "Tetrachlorocarbon" OR "Tetrachloromethane"
- *Websites that can be searched using custom code but not using Google:* these websites have relevant data and/or information in the form of PDFs and the searches can be automated by developing custom code that locates and downloads (i.e., "scrapes") all of the targeted PDFs.
 - ATSDR and NIOSH documents: ATSDR has a series of Public Health Assessments and Health Consultations, and NIOSH has a series of Human Hazard Evaluations that may have documents relevant for the TSCA risk evaluation. Each document is housed at specific URLs within the ATSDR and NIOSH websites. Python code was used to automatically download 100 documents from each site.
 - EPA National Electronic Publications Information System (NEPIS) website: The EPA NEPIS website was another one that used custom code to search. NEPIS houses EPA reports and documents that can be searched by keyword. The NEPIS site uses its own search engine that is not retrievable using Google. Thus, python code was developed to directly access the website search engine and automatically pull the top 100 returned PDFs.
- *Websites that are searched manually:* a manual search is required because the websites house a database or they use their own search engine to retrieve information (e.g., ChemView, NHANES).

The overall strategy for searching these sites is shown in [REF_Ref482713320 \h * MERGEFORMAT]. The lists of sites that were searched (with site-specific inclusion/exclusion criteria) are provided in [REF_Ref482713340 \h * MERGEFORMAT] and [REF_Ref482713358

\h * MERGEFORMAT]. The sites that were originally on the list but removed during curation are provided in [REF_Ref482713374 \h * MERGEFORMAT].

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Overview of Search Strategy for Gray Literature for Fate, Engineering/Occupational Exposure, Exposure, and Human Health Hazard Topic Areas

Search Type	How was List Created?	Sub Search Type	How Was Source Searched?	Search Terms	Date Limit	Literature Search Notes
US Government and International Websites	Compiling list of sources, sources cited in existing problem formulation and assessment documents, and sources cited in the public use document	Manual (sites that cannot be searched using Google)	Searched manually	"56-23-5" OR "Carbon-Tetrachloride"	None	<ul style="list-style-type: none"> Searched all sites and subsites using the carbon tetrachloride CAS number (56-23-5) or the substance name (carbon tetrachloride) Pulled the most recent draft (either draft or final) for assessments.
		Automated, Google API	Searched using Google API	"56-23-5" OR "Carbon-Tetrachloride" OR "Carbon-Chloride" OR "CCl4" OR "Tetrachlorocarbon" OR "Tetrachloromethane"	None	<ul style="list-style-type: none"> Search string is 113 characters (below the 128 character limit) Google's API returns the top 100 hits from each site
		Automated, EPA NEPIS	Searched using code that pulls 100 subsites/pdfs	"tetrachloride"	1991	<ul style="list-style-type: none"> The NEPIS database is a warehouse for EPA documents and reports, and it is not accessible by Google. ICF wrote a custom search for that website. The site is searchable by keyword only, so it was searched using "tetrachloride" The database was searched using a date limit of 1991 to prioritize the 100 most recent EPA documents.
		Automated, ATSDR and NIOSH	Searched using code that pulls 100 subsites/pdfs	"Carbon Tetrachloride"	None	<ul style="list-style-type: none"> Both sources contain a large number of assessments on specific subsites Up to 100 documents were downloaded for each chemical
Trade Association Websites	Using National Association of Manufacturers members list and public use document	Google API	Searched using Google API	"56-23-5" OR "Carbon-Tetrachloride" OR "Carbon-Chloride" OR "CCl4" OR "Tetrachlorocarbon" OR "Tetrachloromethane"	None	<ul style="list-style-type: none"> Search string is 113 characters (below the 128 character limit) Google's API returns the top 100 hits from each site
State Websites	Searching for environ. quality/ management, environ. health/human health, and occupational health and safety subsites	Google API	Searched using Google API	("56-23-5" OR "Carbon-Tetrachloride" OR "CCl4" OR "Tetrachlorocarbon" OR "Tetrachloromethane") AND (assessment OR data)	None	<ul style="list-style-type: none"> State sites tended to have a lot of regulatory or outreach documents which are expected to be less on-topic To focus on reports, assessments, and data, the search string was modified to include the words "data" and "assessment"

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Sources Used For Gray Literature Search for Fate, Engineering/Occupational Exposure, Exposure, and Human Health Hazard Topic Areas with Source-Specific Inclusion/Exclusion Criteria

ID	Trusted Source Category	Source	Source Address	Manual or Automated	Search by?	Search Terms ¹	Source-Specific Inclusion Criteria	Source-Specific Exclusion Criteria
1001	US EPA Resources	Office of Water: EPA Water Regulations*	https://www.epa.gov/regulatory-information-topic/regulatory-information-topic-water	Manual	Chemical	CAS or chemical name	Drinking water regulations under development or currently in place	None
1006	US EPA Resources	Drinking Water Standards and Health Advisories	[HYPERLINK "https://www.epa.gov/sites/production/files/2015-09/documents/dwstandards2012.pdf"]	Manual	Chemical	CAS or chemical name	All chemicals covered by the 2012 standards	None
1008	US EPA Resources	Office of Water: STORET and WQX	[HYPERLINK "https://www.epa.gov/waterdata/storage-and-retrieval-and-water-quality-	Manual	Chemical	CAS or chemical name	The database was downloaded and text files with data specific to included chemicals (metadata and results) were saved in zip files. The website states that the data warehouse includes all data supplied to EPA since 1999.	None

			exchange"]					
1010	US EPA Resources	Office of Air Quality Planning and Standards (OAQPS)	epa.gov/airquality/	Automated	Chemical	Google API terms	Documents containing information about control technologies used to control emissions	FR notices not directly pertaining to chemical of interest; broken links
1011	US EPA Resources	Office of Air: Air Emission Factors*	[HYPERLINK "https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors"]	Manual	Industrial Sector	Sectors and uses identified from public use document and Chemical Data Reporting data	Reviewed chapters to identify information relevant to industrial sectors using professional experience/judgment	None
1012	US EPA Resources	Office of Air: Emission Inventory Improvement Program	[HYPERLINK "https://www.epa.gov/air-emissions-inventories/emission-inventory-improvement-program-eiip"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	

1013	US EPA Resources	Office of Air: National Emissions Inventory (NEI)	[HYPERLINK "https://www.epa.gov/air-emissions-inventories/national-emissions-inventory"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	
1014	US EPA Resources	Office of Air: Ambient Water Quality Criteria documents	[HYPERLINK "http://www.epa.gov/wqc"]	Automated	Chemical	Google API terms	Most-recent water quality criteria human health tables and supporting documents	Previous (prior to 2015) water quality criteria documents; documents not directly pertaining to the chemical of interest
1015	US EPA Resources	Office of Air: HAPS	[HYPERLINK "https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications"]	Automated	Chemical	Google API terms	None	Lists of chemical classified as hazardous air pollutants covered in other sources (covered in the "Lists of Lists" source)
1016	US EPA Resources	Office of Air: NESHAP*	[HYPERLINK "https://www.epa.go	Automated	Chemical	Google API terms	No results returned by search	No results returned by search

			v/technical -air- pollution- resources"]					
1031	US EPA Resources	Office of Air: Urban Air Toxics	[HYPERLINK "https://w ww.epa.go v/urban- air- toxics/urb an-air- toxic- pollutants"]	Manual	Chemical	CAS or chemical name	List of chemicals classified as urban air toxics	None
1032	US EPA Resources	OPPT: TRI, including TRI Guidance Documents*	[HYPERLINK "http://w ww.epa.go v/tri"]	Automated	Chemical	Google API terms	Statistics on emission reductions. Additional data supporting the lifecycle diagram/conceptual model was reviewed using professional judgment/experience.	Fact sheets, reporting forms, grant program information, data (data is provided in a different source)
1038	US EPA Resources	OPPT: TSCA Analog Identification Methodology (AIM)	[HYPERLINK "http://w ww.epa.go v/tsca- screening- tools/anal og- identificati on-	Manual	Chemical	CAS or chemical name	The AIM tool was downloaded and searched to find records for CCL4	None

			methodology-aim-tool"]					
1059	US EPA Resources	Significant New Alternatives Policy (SNAP)	[HYPERLINK "https://www.epa.gov/snap"]	Automated	Chemical	Google API terms	None	Lists of substitutes in different use sectors that link to specific FR notices from the 1990's
1061	US EPA Resources	Safer Choice	[HYPERLINK "https://www.epa.gov/saferchoice/"]	Automated	Chemical	Google API terms	None	Very high-level fact sheets or assessment overviews; assessments found in other sources; staff directories
1064	US EPA Resources	Pollution Prevention	[HYPERLINK "https://www.epa.gov/p2/"]	Automated	Chemical	Google API terms	None	Very high-level fact sheets and case studies; contact information
1070	US EPA Resources	Pesticide Chemical Search	https://iaspub.epa.gov/apex/pesticides/f?p=chemicalsearch:1	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in PDFs	Additional links on the search return page (included in other sources)
1073	US EPA Resources	InertFinder	[HYPERLINK "https://iaspub.epa.gov/apex/pesticides/f?p=101:1:"]	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in PDFs	None

1075	US EPA Resources	Pesticide Ingredients	[HYPERLINK "https://www.epa.gov/ingredients-used-pesticide-products"]	Automated	Chemical	Google API terms	None	High level summaries supporting decisions about classifying inert ingredients
1078	US EPA Resources	Hazardous Waste	[HYPERLINK "https://www.epa.gov/hw/"]	Automated	Chemical	Google API terms	Reports to Congress or other material supporting regulatory decisions	Regulatory documents
1080	US EPA Resources	Superfund chemical data matrix	[HYPERLINK "https://www.epa.gov/superfund/superfund-chemical-data-matrix-scdm-query"]	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in PDFs	None
1081	US EPA Resources	Superfund Enterprise Management System (SEMS)	[HYPERLINK "https://cumulis.epa.gov/super	Automated	Chemical	Google API terms	Quantitative risk assessments performed for Superfund sites	General Superfund site information that did not include quantitative measures of contaminant or exposure

			cpad/courses"]					
1083	US EPA Resources	CPCat	[HYPERLINK "https://actor.epa.gov/cpcat/faces/search.xhtml"]	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in PDFs	None
1090	US EPA Resources	NCEA IRIS	[HYPERLINK "https://www.epa.gov/iris"]	Automated	Chemical	Google API terms	Supporting information for IRIS assessments	Main IRIS landing pages and information from the IRIS Tracker
1097	US EPA Resources	NCEA IRIS	[HYPERLINK "https://cfpub.epa.gov/ncea/iris/search/"]	Manual	Chemical	CAS or chemical name	IRIS overview pages, summary pages, and full toxicological profiles	None
1101	US EPA Resources	ChemView (CDR/IUR)*, with links to hazard characterizations, substantial risk reports, chemical reporting data, chemical test rule data, High Production Volume Information System (HPVIS) data, and alternatives assessments.	[HYPERLINK "http://java.epa.gov/chemview"]	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in PDFs, other than IRIS assessments that were returned from other sources	None
1103	US EPA Resources	Stationary Sources Air Pollution	[HYPERLINK	Automated	Chemical	Google API terms	Documents supporting NESHAP that may contain quantitative data	NESHAP rules and FR notices (regulatory only)

			"https://www.epa.gov/stationary-sources-air-pollution/"]					
1110	US EPA Resources	Economic and cost assessment	[HYPERLINK "https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations"]	Automated	Chemical	Google API terms	Documents containing quantitative data	Documents not containing quantitative data
1113	US EPA Resources	NSCEP documents (NEPIS)	[HYPERLINK "https://nepis.epa.gov/Exe/ZyNET.exe?ZyActionL=Register&User=anonymous&Password=anonymous&	Automated	Chemical	NEPIS	Documents providing quantitative assessments or data	Fact sheets; documents supporting rules that do not have quantitative data

			Client=EPA &Init=1"]					
1118	US EPA Resources	Regulatory Development and Retrospective Review Tracker	yosemite.epa.gov/oepi/rulegate.nsf/	Automated	Chemical	Google API terms	None	Lists of regulations expected to affect particular interests
1120	US EPA Resources	"List of Lists"	[HYPERLINK "https://www.epa.gov/sites/production/files/2015-03/documents/list_of_lists.pdf"]	Manual	Chemical	CAS or chemical name	List of chemicals covered by specific EPA programs	None
1123	US EPA Resources	TSCATS 2.0	[HYPERLINK "https://yosemite.epa.gov/oppts/epatscat8.nsf/reportsearch?openform"]	Manual	Chemical	CAS or chemical name	The database was searched and all low detail report results were PDFed	None
1125	US EPA Resources	EPA Manufacturing/Use	Search epa.gov for each manufacturing sector and use and key words for each manufacturing sector	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	

1141	US EPA Resources	OECA Sector Notebooks	The Sector Notebooks have been archived. Conduct an internet search with the keyword "OECA sector notebook" to see whether there has been a Sector Notebook prepared for the relevant industry	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	
1143	US EPA Resources	EPA Generic Scenarios*	Review the list of currently approved Generic Scenarios for relevant information. The scenarios provide information on process descriptions and guidelines for release and exposure estimates for specific industry sectors.	Manual	Industrial Sector	Sectors and uses identified from public use document and Chemical Data Reporting data	Reviewed the list of currently approved Generic Scenarios for relevant information using professional judgment/experience. The scenarios provide information on process descriptions and guidelines for release and exposure estimates for specific industry sectors.	Information that does not inform the lifecycle diagram or conceptual model.
1144	US EPA Resources	HPV challenge submissions*	cfpub.epa.gov/hpv-s/	Automated	Chemical	Google API terms	Documents providing information relevant to the lifecycle diagrams and conceptual model using professional judgment/experience. Additional quantitative assessments or data were also pulled as part of the broad search.	Broken links
1145	US EPA Resources	OPPT Hazard Characterizations	[HYPERLINK "https://ofmpub.epa.gov/oppth	Manual	Chemical	CAS or chemical name	No results returned by search	No results returned by search

			<p>pv/hpv_hc _character ization.get _report_b y_cas?doc type=2"]</p> <p>[the list of chemicals that have hazard characterization s] with supplemental search for the hazard characterization documents, which are published at [</p> <p>HYPERLINK "https://ja va.epa.gov /chemvie w"] (source id 1101)</p>					
1146	US EPA Resources	EHPV Program Submissions	<p>[</p> <p>HYPERLINK "https://w ww.regula tions.gov/ docket?D= EPA-HQ- OPPT- 2006- 1020"]</p>	Manual	Chemical	CAS or chemical name	No results returned by search	No results returned by search

1147	US EPA Resources	CDAT	https://java.epa.gov/oppt_chemical_search/	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in PDFs	None
1148	US EPA Resources	OPPT Risk-Based Prioritizations	[HYPERLINK "https://ia.spub.epa.gov/oppt_hpv_prioritizations.report"] [the list of chemicals that have prioritizations] with supplemental search for the prioritization reports, which are published at [HYPERLINK "https://java.epa.gov/chemview"] (source id 1101)	Manual	Chemical	CAS or chemical name	No results returned by search	No results returned by search
1149	US EPA Resources	Office of Air: NATA	https://www.epa.gov/national-air-toxics-assessment/2011-nata-assessment-results#pollutant	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in zip files	None
1150	US EPA Resources	Office of Air: AQS	http://aqsdr1.epa.gov/aqsweb/aqstmp/airdata/	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in csv files	None

			download_files. html#Annual					
1151	US EPA Resources	OPPT Monitoring Database	Monitoring database	Manual	Chemical	CAS or chemical name	All monitoring data	None
1152	US EPA Resources	TSCA public use document and stakeholder input	[HYPERLINK "https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/evaluating-risk-existing-chemicals-under-tsca"]	Manual	Chemical	CAS or chemical name	Quantitative data, use information, and information in public input	None
1153	US EPA Resources	TSCA Problem Formulations, Risk Assessments, and Public Comments	[HYPERLINK "https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/assessments-tsca-work-	Manual	Chemical	CAS or chemical name	Quantitative data, lifecycle information, production information, use information, and information in public comments	None

			plan-chemicals"]					
2001	Other US Agency Resources	National Institutes of Health (NIH) ChemIDplus	[HYPERLINK "http://chem.sis.nlm.nih.gov/chemidplus/"]	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page (with active links) PDFed	The PDF has active links, but not all links were followed and subsequently tagged
2010	Other US Agency Resources	NIH PubChem Compound Database	https://www.ncbi.nlm.nih.gov/pcccompound	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page (with active links) PDFed	The PDF has active links, but not all links were followed and subsequently tagged
2018	Other US Agency Resources	NIH HazMap*	http://hazmap.nlm.nih.gov/index.html	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page (with active links) PDFed Additional data supporting the lifecycle diagram/conceptual model was reviewed using professional judgment/experience.	The PDF has active links, but not all links were followed and subsequently tagged
2019	Other US Agency Resources	NIH Household Products Database	http://householdproducts.nlm.nih.gov/	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page (with active links) PDFed	The PDF has active links, but not all links were followed and subsequently tagged
2020	Other US Agency Resources	NIH Hazardous Substance Data Bank (HSDB)*	https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page (with active links) PDFed Additional data supporting the lifecycle diagram/conceptual model was reviewed using professional judgment/experience.	None
2021	Other US Agency Resources	NIH LACTMED	https://toxnet.nlm.nih.gov/newtoxnet/lactmed.htm	Manual	Chemical	CAS or chemical name	No results returned by search	No results returned by search
2022	Other US Agency Resources	NIH NLM Drug Information Portal	https://druginfo.nlm.nih.gov/drugportal/	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and all information returned was included in zip files	None
2027	Other US Agency Resources	NTP Report on Carcinogens (RoC)	https://ntp.niehs.nih.gov/pubhealth/roc/index-1.html#C	Manual	Chemical	CAS or chemical name	Report on Carcinogens substance profiles	Fact sheets; scientific review documents (covered in another source)
2028	Other US Agency Resources	NTP Report on Carcinogens (RoC) Supplemental Materials	https://ntp.niehs.nih.gov/pubhealth/roc/listings/index.html	Manual	Chemical	CAS or chemical name	Report on Carcinogens 2013 monograph, substance information sheets, nomination documents, and review documents	Older Report on Carcinogens monographs (2013 document is comprehensive)

2039	Other US Agency Resources	NTP Health Assessment and Translation Completed Reports	https://ntp.niehs.nih.gov/pubhealth/hat/noms/index.html	Manual	Chemical	CAS or chemical name	NTP monographs for applicable chemicals from list of all documents.	None
2100	Other US Agency Resources	CDC ATSDR Tox Profiles*	[HYPERLINK "http://www.atsdr.cdc.gov/toxprofiles/index.asp"]	Manual	Chemical	CAS or chemical name	ATSDR tox profiles	None
2101	Other US Agency Resources	CDC ATSDR Minimal Risk Levels (MRLs) for Hazardous Substances	[HYPERLINK "https://www.atsdr.cdc.gov/mrls/mrlist.asp"]	Manual	Chemical	CAS or chemical name	Minimum risk levels	None
2103	Other US Agency Resources	CDC ATSDR	[HYPERLINK "https://www.atsdr.cdc.gov/"]	Automated	Chemical	ATSDR/NIOSH	Case studies; addendums to tox profiles	Fact sheets; quantitative information already given in tox profiles; documents that do not provide quantitative data
2104	Other US Agency Resources	CDC ATSDR Health Hazard Consultations	[HYPERLINK "http://www.atsdr.cdc.gov/hac/pha/"]	Automated	Chemical	ATSDR/NIOSH	Health Hazard Consultations for the chemicals of interest	None
2111	Other US Agency Resources	CDC National Report on Human Exposure to Environmental Chemicals	[HYPERLINK "https://w	Manual	Chemical	CAS or chemical name	NHANES data summaries	None

			ww.cdc.gov/exposurereport/index.html"]					
2113	Other US Agency Resources	CDC NIOSH*	[HYPERLINK "https://www.cdc.gov/niosh/"]	Automated	Chemical	ATSDR/ NIOSH	Documents providing quantitative data. Additional data supporting the lifecycle diagram/conceptual model was reviewed using professional judgment/experience.	Documents captured in manual search; methods for detection (NMAM manuals); peer review articles captured in peer-reviewed literature search; draft versions of documents previously captured; letters; PowerPoint presentations for public; very high-level fact sheets and case studies; public comments; documents discussing TALC (asbestos free); case report on single occupational exposure; general lists of resources.
2115	Other US Agency Resources	CDC NIOSH*	[HYPERLINK "http://www.cdc.gov/niosh/npg/npgdcas.html"]	Manual	Chemical	CAS or chemical name	Selected entries from list by Chemical Name and CAS number; NIOSH Pocket Guide to Chemical Hazards captured for all chemicals. Additional data supporting the lifecycle diagram/conceptual model was reviewed using professional judgment/experience.	None
2116	Other US Agency Resources	CDC NIOSH	[HYPERLINK "http://www.cdc.gov/niosh/topics/chemical.html"]	Manual	Chemical	CAS or chemical name	Documents from chemical-topic pages.	Methods for detection (NMAM manuals); documents captured in other NIOSH manual search; linked out documents from other government agencies.
2123	Other US Agency Resources	CDC NIOSH Health Hazard Evaluations*	[HYPERLINK "https://www2a.cdc.gov/hhe/s	Manual	Chemical	CAS or chemical name	Human hazard evaluation reports	Human hazard evaluation reports that do not measure chemicals of interest

			earch.asp"]					
2125	Other US Agency Resources	CDC NIOSH Immediately Dangerous to Life or Health	[HYPERLINK "https://www.cdc.gov/niosh/idlh/intridl4.html"]	Manual	Chemical	CAS or chemical name	Immediately Dangerous to Life or Health summary pages captured for all chemicals, selected from list.	None
2128	Other US Agency Resources	CDC NIOSH International Chemical Safety Cards (ICSC)	[HYPERLINK "https://www.cdc.gov/niosh/ipcsneng/ncngcas.html"]	Manual	Chemical	CAS or chemical name	Searched by CAS number; International Chemical Safety Cards (ICSC) captured for all chemicals.	None
2200	Other US Agency Resources	Bureau of Labor Statistics (BLS)	[HYPERLINK "http://www.bls.gov/"]	Automated	Chemical	Google API terms	No results returned by search	No results returned by search
2202	Other US Agency Resources	Census Bureau	[HYPERLINK "http://www.census.gov/"]	Automated	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	
2204	Other US Agency Resources	Census Bureau: NAICS Determination*	[HYPERLINK "http://www.census	Manual	NAICS Code	NAICS Code	Data supporting the lifecycle diagram/conceptual model was reviewed using professional judgment/experience.	None

			.gov/eos/ www/naics/"]					
2205	Other US Agency Resources	Census Bureau: SIC and NAICS codes	[HYPERLINK "http://www.census.gov/eos/www/naics/concordances/concordances.html"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	
2206	Other US Agency Resources	Census Bureau: Current Industrial Reports	[HYPERLINK "http://www.census.gov/manufacturing/cir/index.html"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	
2207	Other US Agency Resources	Census Bureau: Annual Survey of Manufacturers	[HYPERLINK "http://www.census.gov/programs-surveys/as m.html"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	
2208	Other US Agency Resources	Census Bureau: County Business Patterns	[HYPERLINK	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	

			"http://www.census.gov/programs-surveys/cbp.html"]				
2210	Other US Agency Resources	Census Bureau: Data Sources for Manufacturing from the US Census Bureau	[HYPERLINK "http://www.census.gov/econ/manufacturing.html"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.
2211	Other US Agency Resources	Census Bureau: American Housing Survey	[HYPERLINK "https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html" \ "?s_areas=a00000&s_year=n2015&s_tableName=Ta	Manual	None	CAS or chemical name	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.

			ble1&s_by Group1=a 1&s_byGr oup2=a1& s_filterGro up1=t1&s_ filterGroup 2=g1"]				
2212	Other US Agency Resources	Census Bureau: American Community Survey	[HYPERLINK "http://w ww.census .gov/acs/w ww/data/ data- tables- and- tools/data - profiles/20 15/"]	Manual	None	CAS or chemical name	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.
2213	Other US Agency Resources	Census Bureau: Commodity Flow Survey	[HYPERLINK "http://w ww.census .gov/econ/ cfs/"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.
2214	Other US Agency Resources	Census Bureau: Foreign Trade	[HYPERLINK "http://w ww.census	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.

			.gov/foreign-trade/about/index.html"]					
2215	Other US Agency Resources	Census Bureau: Survey of Plant Capacity Utilization	[HYPERLINK "http://www.census.gov/manufacturing/capacity/"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	
2216	Other US Agency Resources	Census Bureau: Statistics of US Businesses	[HYPERLINK "http://www.census.gov/programs-surveys/susb/data.html"]	Manual	NAICS Code	NAICS Code	This source will be searched once the assessment team determines the list of NAICS codes to search the database likely during problem formulation.	
2217	Other US Agency Resources	CPSC Consumer Product Safety Commission	[HYPERLINK "http://www.cpsc.gov/"]	Automated	Chemical	Google API terms	No results returned by search	No results returned by search
2300	Other US Agency Resources	FDA Food and Drug Administration	[HYPERLINK "http://www.fda.gov/"]	Automated	Chemical	Google API terms	Chemicals of interest noted in drug labels, drug use, or other documents; guidance for industry documents; FR notices with helpful use/product information or quantitative values; Relevant GRAS notices; FDA Total Diet Study Survey results; list of prohibited chemicals for cosmetics.	Documents captured in manual search; CV of FDA researchers, FR notices with no quantitative values; documents related to drugs for mesothelioma treatment; public comments with no quantitative data; documents that state chemical measured in product, but not detected; PowerPoint

								presentations for public; very high-level fact sheets; citizen petition.
2301	Other US Agency Resources	FDA Databases	[HYPERLINK "http://www.accessdata.fda.gov/"]	Automated	Chemical	Google API terms	Chemicals of interest noted in drug labels, drug use, production info or other relevant documents; FR notices with helpful use/product information or quantitative values.	Documents captured in manual search; FR notices with no quantitative values; documents discussing TALC (asbestos free); documents with no chemical-specific information; DCM mentioned as used as a solvent; methods for detection; very high-level fact sheets.
2304	Other US Agency Resources	FDA Cumulative Estimated Daily Intake	[HYPERLINK "http://www.accessdata.fda.gov/scripts/sda/sdNavigation.cfm?sd=edisrev"]	Manual	Chemical	CAS or chemical name	Searched by CAS number; all Cumulative Estimates Daily Intakes captured for chemicals having this information.	None
2306	Other US Agency Resources	FDA Everything Added to Food in the United States (EAFUS)	[HYPERLINK "http://www.fda.gov/Food/IngredientsPackagingLabeling/FoodAdditivesIngredients/ucm115326.htm"]	Manual	Chemical	CAS or chemical name	Database searched by CAS number; all entries captured.	None

2307	Other US Agency Resources	FDA List of Indirect Additives Used in Food Contact Substances	[HYPERLINK "http://www.fda.gov/Food/IngredientsPackagingLabeling/PackagingFCS/IndirectAdditives/ucm115333.htm"]	Manual	Chemical	CAS or chemical name	Database searched by CAS number; all entries captured.	None
2400	Other US Agency Resources	OSHA Occupational Safety and Health Administration	[HYPERLINK "http://www.osha.gov/"]	Automated	Chemical	Google API terms	Regulatory limits; reports with quantitative data; data from the occupational chemical database	Detection methods papers; factsheets and evaluation guidance
2414	Other US Agency Resources	OSHA Chemical Exposure Health Data*	[HYPERLINK "https://www.osha.gov/opengov/healthsamples.html"]	Manual	Chemical	CAS or chemical name	OSHA PELs. Additional data supporting the lifecycle diagram/conceptual model was reviewed using professional judgment/experience.	None
2502	Other US Agency Resources	NIST	[HYPERLINK "http://www.nist.gov/"]	Automated	Chemical	Google API terms	Conference proceedings that may not be in peer-reviewed search	Peer-reviewed articles; detection method papers

2504	Other US Agency Resources	NOAA CAMEO database	[HYPERLINK "https://cameochemicals.noaa.gov/"]	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page PDFed	None
2507	Other US Agency Resources	Protective Action Criteria (PAC) Database	https://sp.eota.energy.gov/pac/teel/search.html	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page PDFed	None
2509	Other US Agency Resources	US Geological Survey	[HYPERLINK "http://www.usgs.gov/"]	Automated	Chemical	Google API terms	Documents providing quantitative data.	Peer reviewed papers; employee contact information;
2511	Other US Agency Resources	Department of Energy	[HYPERLINK "http://www.energy.gov/"]	Automated	Chemical	Google API terms	Medical Surveillance Program information and needs assessments	Fact sheets; documents containing no quantitative data
2512	Other US Agency Resources	PNNL Pacific Northwest National Laboratory	[HYPERLINK "http://www.pnnl.gov/"]	Automated	Chemical	Google API terms	Documents providing quantitative data.	Fact sheets; employee contact information; documents that do not provide quantitative data
2513	Other US Agency Resources	US Geological Survey publications	[HYPERLINK "https://pubs.er.usgs.gov/"]	Automated	Chemical	Google API terms	Groundwater quality data; documents containing use information or quantitative data	Peer reviewed papers; documents that do not provide quantitative data
3000	International Resources	European Commission	ec.europa.eu	Manual	Chemical	CAS or chemical name	Documents containing quantitative data or use information	Documents not containing quantitative data or use information

3005	International Resources	European Commission	eur-lex.europa.eu/collection/eu-law.html	Automated	Chemical	Google API terms	Documents containing quantitative data or use information	Documents not containing quantitative data or use information
3057	International Resources	ECHA Documents	echa.europa.eu/documents/	Manual	Chemical	CAS or chemical name	Documents containing quantitative data or use information	Documents not containing quantitative data or use information
3100	International Resources	IARC Monograph	http://monographs.iarc.fr/ENG/Monographs/PDFs/index.php	Manual	Chemical	CAS or chemical name	Most-recent IARC monographs	Previous (not current) IARC monographs
3150	International Resources	OECD HPV Programme	http://webnet.oecd.org/hpv/ui/Search.aspx	Manual	Chemical	CAS or chemical name	Initial assessments, final assessments, and recommendations	None
3155	International Resources	OECD Emission Scenario Documents*	oecd.org/chemicalsafety/risk-assessment/emissionscenariodocuments.htm	Manual	NAICS Code	NAICS Code	Data supporting the lifecycle diagram/conceptual model was reviewed using professional judgment/experience.	None
3156	International Resources	OECD Substitution and Alternatives Assessment Tool Selector – Case Studies	oecd-saatoolbox.org/Home/CaseStudies	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page PDFed	None
3200	International Resources	United Nations Environment Program (UNEP)	unep.org/	Automated	Chemical	Google API terms	No results returned by search	No results returned by search
3250	International Resources	WHO Institutional Repository for Information Sharing (IRIS)	[HYPERLINK "http://apps.who.int/iris/"]	Automated	Chemical	Google API terms	Documents containing quantitative data or use information	Documents not containing quantitative data or use information
3253	International Resources	World Health Organization-Regional Office for Europe	[HYPERLINK "http://www.euro.who.int/en/home"]	Automated	Chemical	Google API terms	None	Fact sheets
3300	International Resources	Stockholm Convention on Persistent Organic Pollutants	http://chm.pops.int/TheConvention/ThePOPs/Lis	Manual	Chemical	CAS or chemical name	Risk Profiles	None

			tingofPOPs/tabid/2509/Default.aspx					
3350	International Resources	Australian Government: Department of Health, National Industrial Chemicals; NICNAS	[HYPERLINK "https://www.nicnas.gov.au/"]	Automated	Chemical	Google API terms	Chemical profiles; public reports with quantitative data;	Regulatory lists; fact sheets; reports with no quantitative data
3421	International Resources	Canada Chemicals Portal	chemicalsubstanceschimiques.gc.ca/index-eng.php	Manual	Chemical	CAS or chemical name	Screening assessments and general descriptions of Canada's actions on chemicals of interest	Documents not containing quantitative data or use information
3425	International Resources	Carex Canada	[HYPERLINK "http://www.carexcanada.ca/en/"]	Automated	Chemical	Google API terms	Documents containing quantitative data or use information	Documents not containing quantitative data or use information
3450	International Resources	GESTIS Database	[HYPERLINK "http://limitvalue.ifa.dguv.de/"]	Manual	Chemical	CAS or chemical name	Lists of international regulatory limits	None
3520	International Resources	Government of Japan: Ministry of the Environment	env.go.jp/en/	Automated	Chemical	Google API terms	Documents containing quantitative data or use information	Documents not containing quantitative data or use information
3600	International Resources	Substances in Preparations in Nordic Countries (SPIN) Database	[HYPERLINK "http://www.spin2000.net/spinmyphp/"]	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page PDFed	None

5000	Other Resources	Lowell Center for Sustainable Production	[HYPERLINK "http://www.sustainableproduction.org/"]	Automated	Chemical	Google API terms	Documents containing quantitative data or use information; recommendations or overall chemical summaries	Fact sheets; press releases; older versions of current reports (e.g., causes of cancer)
5011	International Resources	eChemPortal	http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page PDFed	None
5014	Other Resources	Toxicology Excellence for Risk Assessment	[HYPERLINK "http://www.tera.org/"]	Manual	Chemical	CAS or chemical name	Documents containing quantitative data or recommendations for analysis	Documents not containing quantitative data or recommendations for analysis
5019	Other Resources	Consumer Products Information Database (CPID)	[HYPERLINK "https://www.whatsinproducts.com/chemicals/index/1"]	Manual	Chemical	CAS or chemical name	The database was searched by CAS number and the result page PDFed	None
5020	Other Resources	Pollution Prevention Infohouse	infohouse.p2ric.org/	Automated	Chemical	Google API terms	Documents containing quantitative data or regulatory lists of chemicals by state	Documents not containing quantitative data or regulatory lists of chemicals by state
5027	Other Resources	Kirk Othmer Encyclopedia*	Book	Manual	Chemical	CAS or chemical name	Searched by chemical name in volume index. Captured all entries pertaining to chemical of interest.	Brief mentions of chemical in entries for other chemicals not included in this search
5028	Other Resources	Ashford's Dictionary of Industrial Chemicals, 2001	Book	Manual	Chemical	CAS or chemical name	Searched by chemical name in index. Captured dictionary entries for chemical of interest.	None
5029	Other Resources	Hawley's Chemical Dictionary, 2016	Book	Manual	Chemical	CAS or chemical name	Searched by chemical name in index. Captured dictionary entries for chemical of interest.	None

6000	States	Custom search engine using States sites (see separate table)	multiple	Automated	Chemical	States	Documents containing quantitative data or regulatory lists of chemicals by state	Documents not containing quantitative data or regulatory lists of chemicals by state, including fact sheets
7141	Trade/ Professional	American Composites Manufacturers Association	[HYPERLINK "http://www.acmanet.org/"]	Automated	Chemical	Google API terms	Trade association websites were searched by search strings containing CAS number and common chemical synonyms. If a search result was a pdf file it was captured automatically, otherwise a webpage with active links was captured. On-topic documents included industrial processes and uses, production and trade data, court proceedings, regulatory response from industry, and regulatory guidance documents.	Documents such as news releases that do not contain quantitative data beyond general use information. Documents describing analytical processes where chemical was used in apparatus, reagent, or reference material. Documents describing non-current use such as pre 1980 uses of asbestos. Documents describing alternative use compounds to the chemical being searched.
7142	Trade/ Professional	Aerospace Industries Association of America	[HYPERLINK "http://www.aia-aerospace.org/"]	Automated	Chemical	Google API terms		
7144	Trade/ Professional	American Chemistry Council	[HYPERLINK "http://www.americanchemistry.com/"]	Automated	Chemical	Trade association terms		
7146	Trade/ Professional	Asphalt Roofing Manufacturers Association	[HYPERLINK "http://www.asphaltroofing.org/"]	Automated	Chemical	Trade association terms		
7153	Trade/ Professional	Chemistry Industry Association of Canada	[HYPERLINK "http://www.canadi	Automated	Chemical	Trade association terms		

			anchemist ry.ca/"]					
7156	Trade/ Professional	European Flame Retardant Association	[HYPERLINK "http://w ww.cefic- efra.com/"]	Automated	Chemical	Trade association terms		
7159	Trade/ Professional	Consumer Specialty Products Association	[HYPERLINK "http://w ww.cspa.o rg/"]	Automated	Chemical	Trade association terms		
7163	Trade/ Professional	European Brominated Flame Retardant Industry Panel	[HYPERLINK "http://w ww.ebfrip. org/"]	Automated	Chemical	Trade association terms		
7172	Trade/ Professional	Juvenile Products Manufacturers Association	[HYPERLINK "http://w ww.jpma.o rg/"]	Automated	Chemical	Trade association terms		
7176	Trade/ Professional	National Association of Manufacturers	[HYPERLINK "http://w ww.nam.o rg/"]	Automated	Chemical	Trade association terms		
7200	Trade/ Professional	Phosphorous, Inorganic, & Nitrogen Flame Retardants Association	[HYPERLINK "http://w	Automated	Chemical	Trade association terms		

			ww.pinfa.org/"]					
7201	Trade/ Professional	Plastic Pipes Institute	[HYPERLINK "http://w ww.plastic pipe.org/"]	Automated	Chemical	Trade association terms		
7209	Trade/ Professional	Structural Insulated Panel Association	[HYPERLINK "http://w ww.sips.or g/"]	Automated	Chemical	Trade association terms		
7210	Trade/ Professional	Society of Chemical Manufacturers and Affiliates	[HYPERLINK "http://w ww.socma .com/"]	Automated	Chemical	Trade association terms		
7224	Trade/ Professional	American Composites Manufacturers Association	[HYPERLINK "http://w ww.acman et.org/"]	Automated	Chemical	Trade association terms		
7233	Trade/ Professional	American Fiber Manufacturers Association	[HYPERLINK "http://w ww.afma. org/"]	Automated	Chemical	Trade association terms		
7235	Trade/ Professional	American Foundry Society	[HYPERLINK "http://w	Automated	Chemical	Trade association terms		

			ww.afsinc.org/"]					
7237	Trade/ Professional	American Gas Association	[HYPERLINK "http://www.aga.org/"]	Automated	Chemical	Trade association terms		
7242	Trade/ Professional	Air-Conditioning, Heating, & Refrigeration Institute	[HYPERLINK "http://www.ahrinet.org/"]	Automated	Chemical	Trade association terms		
7245	Trade/ Professional	Aluminum Association	[HYPERLINK "http://www.aluminum.org/"]	Automated	Chemical	Trade association terms		
7247	Trade/ Professional	Association for Manufacturing Excellence	[HYPERLINK "http://www.ame.org/"]	Automated	Chemical	Trade association terms		
7250	Trade/ Professional	American Chemistry Council	[HYPERLINK "http://www.americanchemistry.com/"]	Automated	Chemical	Trade association terms		
7254	Trade/ Professional	American National Standards Institute	[HYPERLINK "http://w	Automated	Chemical	Trade association terms		

			ww.ansi.org/"]					
7256	Trade/ Professional	American Petroleum Institute	[HYPERLINK "http://www.api.org/"]	Automated	Chemical	Trade association terms		
7260	Trade/ Professional	The Adhesive and Sealant Council	[HYPERLINK "http://www.ascouncil.org/"]	Automated	Chemical	Trade association terms		
7266	Trade/ Professional	American Wood Council	[HYPERLINK "http://www.awc.org/"]	Automated	Chemical	Trade association terms		
7274	Trade/ Professional	Business & Institutional Furniture Mfrs Association	[HYPERLINK "http://www.bifma.org/"]	Automated	Chemical	Trade association terms		
7281	Trade/ Professional	Can Manufacturers Institute	[HYPERLINK "http://www.central.com/"]	Automated	Chemical	Trade association terms		
7295	Trade/ Professional	European Chlorinated Solvents Association	[HYPERLINK "http://w	Automated	Chemical	Trade association terms		

			ww.chlorinated-solvents.eu/"]					
7298	Trade/ Professional	Council of Industrial Boiler Owners	[HYPERLINK "http://www.cibo.org/"]	Automated	Chemical	Trade association terms		
7300	Trade/ Professional	American Cleaning Institute	[HYPERLINK "http://www.cleaninginstitute.org/"]	Automated	Chemical	Trade association terms		
7304	Trade/ Professional	Copper Development Association Inc	[HYPERLINK "http://www.copper.org/"]	Automated	Chemical	Trade association terms		
7308	Trade/ Professional	Consumer Specialty Products Association	[HYPERLINK "http://www.cspa.org/"]	Automated	Chemical	Trade association terms		
7346	Trade/ Professional	Flexible Packaging Association	[HYPERLINK "http://www.flexpack.org/"]	Automated	Chemical	Trade association terms		

7354	Trade/ Professional	Gasket Fabricators Association	[HYPERLINK "http://w ww.gasket fab.com/"]	Automated	Chemical	Trade association terms		
7358	Trade/ Professional	Global Automakers	[HYPERLINK "http://w ww.global automaker s.org/"]	Automated	Chemical	Trade association terms		
7359	Trade/ Professional	Grocery Manufacturers Association	[HYPERLINK "http://w ww.gmaon line.org/"]	Automated	Chemical	Trade association terms		
7374	Trade/ Professional	Halogenated Solvents Industry Alliance, Inc. (HSIA)	[HYPERLINK "http://w ww.hsia.or g/"]	Automated	Chemical	Trade association terms		
7382	Trade/ Professional	Independent Lubricant Manufacturers Association	[HYPERLINK "http://w ww.ilma.o rg/"]	Automated	Chemical	Trade association terms		
7386	Trade/ Professional	Association of Nonwoven Fabrics Industry	[HYPERLINK "http://w	Automated	Chemical	Trade association terms		

			ww.inda.org/"]					
7392	Trade/ Professional	Association Connecting Electronics Industries	[HYPERLINK "http://www.ipc.org/"]	Automated	Chemical	Trade association terms		
7395	Trade/ Professional	Institute of Scrap Recycling Industries	[HYPERLINK "http://www.isri.org/"]	Automated	Chemical	Trade association terms		
7396	Trade/ Professional	The Worldwide Cleaning Industry Association	[HYPERLINK "http://www.issa.com/"]	Automated	Chemical	Trade association terms		
7398	Trade/ Professional	Juvenile Products Manufacturers Association	[HYPERLINK "http://www.jpma.org/"]	Automated	Chemical	Trade association terms		
7419	Trade/ Professional	Motor & Equipment Manufacturers Association	[HYPERLINK "http://www.mema.org/"]	Automated	Chemical	Trade association terms		
7433	Trade/ Professional	National Association for Surface Finishing	[HYPERLINK "http://w	Automated	Chemical	Trade association terms		

			www.nasf.org/"]					
7440	Trade/ Professional	National Electrical Manufacturers Association	[HYPERLINK "http://www.nema.org/"]	Automated	Chemical	Trade association terms		
7444	Trade/ Professional	Natural Gas Supply Association	[HYPERLINK "http://www.ngsa.org/"]	Automated	Chemical	Trade association terms		
7453	Trade/ Professional	N-Methylpyrrolidone Producers Group, Inc.	[HYPERLINK "http://www.nmpgroup.com/"]	Automated	Chemical	Trade association terms		
7471	Trade/ Professional	Petroleum Equipment Institute	[HYPERLINK "http://www.pei.org/"]	Automated	Chemical	Trade association terms		
7473	Trade/ Professional	Personal Care Products Council	[HYPERLINK "http://www.personalcarecouncil.org/"]	Automated	Chemical	Trade association terms		
7483	Trade/ Professional	Precision Machined Products Association	[HYPERLINK	Automated	Chemical	Trade association terms		

			"http://www.pmpa.org/"]					
7485	Trade/Professional	Power Tool Institute, Inc.	[HYPERLINK "http://www.power toolinstitute.com/"]	Automated	Chemical	Trade association terms		
7489	Trade/Professional	Printing Industries of America	[HYPERLINK "http://www.printing.org/"]	Automated	Chemical	Trade association terms		
7490	Trade/Professional	Pressure Sensitive Tape Council	[HYPERLINK "http://www.pstc.org/"]	Automated	Chemical	Trade association terms		
7498	Trade/Professional	Roof Coatings Manufacturers Association	[HYPERLINK "http://www.roofcoatings.org/"]	Automated	Chemical	Trade association terms		
7502	Trade/Professional	Specialty Equipment Market Association	[HYPERLINK "http://www.sema.org/"]	Automated	Chemical	Trade association terms		

7511	Trade/ Professional	Society of Manufacturing Engineers	[HYPERLINK "http://w ww.sme.or g/"]	Automated	Chemical	Trade association terms		
7513	Trade/ Professional	Society of Chemical Manufacturers & Affiliates	[HYPERLINK "http://w ww.socma .com/"]	Automated	Chemical	Trade association terms		
7516	Trade/ Professional	SteelWorks	[HYPERLINK "http://w ww.steel.o rg/"]	Automated	Chemical	Trade association terms		
7520	Trade/ Professional	Textile Care Allied Trades Association	[HYPERLINK "http://w ww.tcata.o rg/"]	Automated	Chemical	Trade association terms		
7531	Trade/ Professional	Textile Rental Services Association of America	[HYPERLINK "http://w ww.trsa.or g/"]	Automated	Chemical	Trade association terms		
7541	Trade/ Professional	Vinyl Siding Institute	[HYPERLINK "http://w ww.vinylsi ding.org/"]	Automated	Chemical	Trade association terms		

7554	Trade/ Professional	Extruded Polystyrene Foam Association	[HYPERLINK "http://w ww.xpsa.c om/"]	Automated	Chemical	Trade association terms		
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* Asterisk denotes sources that were part of the lifecycle/conceptual model search.

¹ See [REF_Ref482713320 \h * MERGEFORMAT] for list of search terms and keywords

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. List of State Websites Included in the “States” Search for Fate, Engineering/Occupational Exposure, Exposure, and Human Health Hazard Topic Areas

State	Type	Title	URL
Alabama	Environment	Alabama Department of Environmental Management	[HYPERLINK "http://www.adem.state.al.us/"]
Alabama	Occupational Health	Alabama Occupational Safety and Health	[HYPERLINK "http://www.labor.alabama.gov/ /"]
Alabama	Environmental Health/Health	Environmental - Home - Alabama Department of Public Health	[HYPERLINK "http://www.adph.org/enviro nmental"]
Alaska	Environment	Alaska Department of Environmental Conservation - State of Alaska	[HYPERLINK "http://www.dec.alaska.gov/"]
Alaska	Environment	Environment - Environment Alaska	[HYPERLINK "http://www.environmentalaska .us/"]
Alaska	Occupational Health	Alaska Occupational Safety and Health Section - Alaska Department ...	[HYPERLINK "http://www.labor.state.ak.us/l s/oshhome.htm"]
Arizona	Environment	ADEQ Arizona Department of Environmental Quality Our mission is ...	[HYPERLINK "http://www.azdeq.gov/"]
Arizona	Occupational Health	ADOSH Main Page Industrial Commission of Arizona	[HYPERLINK "http://www.azica.gov/our- organization/adosh"]
Arizona	Environmental Health/Health	Arizona Department of Health Services	[HYPERLINK "http://www.azdhs.gov/"]
Arizona	Environmental Health/Health	ADEQ Arizona Department of Environmental Quality Our mission is ...	[HYPERLINK "http://www.azdeq.gov/"]

Arizona	Environmental Health/Health	Arizona Children's Environmental Health Program	[HYPERLINK "http://www.legacy.azdeq.gov/c eh/"]
Arkansas	Environment	Arkansas Department of Environmental Quality (ADEQ)	[HYPERLINK "http://www.adeq.state.ar.us/"]
Arkansas	Occupational Health	Occupational Health and Safety Compliance Program	[HYPERLINK "http://www.labor.arkansas.gov /occupational-safety-and- health-compliance-program- aosh"]
Arkansas	Environmental Health/Health	ADH: Environmental Health - Arkansas Department of Health	[HYPERLINK "http://www.healthy.arkansas.g ov/"]
California	Environment	California Environmental Protection Agency: CalEPA	[HYPERLINK "http://www.calepa.ca.gov/"]
California	Environment	California Department of Conservation	[HYPERLINK "http://www.conservation.ca.go v/"]
California	Environment	California Department of Toxic Substances Control	[HYPERLINK "http://www.dtsc.ca.gov/"]
California	Occupational Health	Occupational Health Branch main page - California Department of ...	[HYPERLINK "http://www.cdph.ca.gov/"]
California	Occupational Health	Cal/OSHA - Division of Occupational Safety and Health - Home Page	[HYPERLINK "http://www.dir.ca.gov/dosh"]
California	Environmental Health/Health	Biomonitoring California	[HYPERLINK "http://www.biomonitoring.ca.g ov/"]
California	Environmental Health/Health	Office of Environmental Health Hazard Assessment	[HYPERLINK "http://www.oehha.ca.gov/"]

California	Environmental Health/Health	Department of Public Health: Environmental Health	[HYPERLINK "http://www.cdph.ca.gov/programs/Pages/CenterEnvironmentalHealth.aspx"]
Colorado	Environmental Health/Health	Colorado Department of Public Health and Environment	[HYPERLINK "http://www.cdphe.state.co.us/"]
Connecticut	Environment	Connecticut Department of Energy & Environmental Protection	[HYPERLINK "http://www.ct.gov/dep/"]
Connecticut	Occupational Health	DPH: Occupational Health Unit - CT.gov	[HYPERLINK "http://www.ct.gov/dph/occupationalhealth"]
Connecticut	Occupational Health	Occupational Safety & Health (CONN-OSHA) - State of Connecticut ...	[HYPERLINK "http://www.ctdol.state.ct.us/osh/osh.htm"]
Connecticut	Environmental Health/Health	Department of Public Health: Environmental Health	[HYPERLINK "http://www.ct.gov/dph/"]
Delaware	Environment	Delaware Department of Natural Resources and Environmental ...	[HYPERLINK "http://www.dnrec.state.de.us/"]
Delaware	Environment	State of Delaware - Topics - Environment	[HYPERLINK "http://www.delaware.gov/topics/environment"]
Delaware	Occupational Health	Delaware Office of Occupational Health	[HYPERLINK "http://www.dhss.delaware.gov/dph/hsp/oh.html"]
Delaware	Environmental Health/Health	Division of Public Health - Delaware Health and Social Services ...	[HYPERLINK "http://www.dhss.delaware.gov/dhss/dph/"]

Florida	Environment	Welcome Florida Department of Environmental Protection (DEP)	[HYPERLINK "http://www.dep.state.fl.us/"]
Florida	Environmental Health/Health	Environmental Health	[HYPERLINK "http://www.floridahealth.gov/e nvironmental-health/"]
Georgia	Environment	Environmental Protection Division A Division of the Georgia ...	[HYPERLINK "http://www.epd.georgia.gov/"]
Georgia	Occupational Health	Georgia Occupational Health and Safety Surveillance Program ...	[HYPERLINK "http://www.dph.georgia.gov/g eorgia-occupational-health-and- safety-surveillance-program"]
Georgia	Environmental Health/Health	Environmental Health Georgia Department of Public Health	[HYPERLINK "http://www.dph.georgia.gov/e nvironmental-health"]
Hawaii	Environment	Office of Environmental Quality Control (OEQC) - Hawaii Department ...	[HYPERLINK "http://www.health.hawaii.gov/ "]
Hawaii	Occupational Health	Hawaii Occupational Safety and Health - Department of Labor and ...	[HYPERLINK "http://www.labor.hawaii.gov/"]
Hawaii	Environmental Health/Health	Hawaii Environmental Health Portal	[HYPERLINK "http://www.eha- cloud.doh.hawaii.gov/"]
Idaho	Environment	Idaho Department of Environmental Quality: Home	[HYPERLINK "http://www.deq.idaho.gov/"]
Idaho	Environmental Health/Health	Environmental Health - Idaho Department of Health and Welfare	[HYPERLINK "http://www.healthandwelfare.i daho.gov/"]
Illinois	Environment	Illinois Environmental Protection Agency	[HYPERLINK "http://www.epa.illinois.gov/"]

Illinois	Occupational Health	Illinois OSHA: Illinois OSHA	[HYPERLINK "http://www.osha.illinois.gov/"]
Illinois	Environmental Health/Health	Illinois Department of Public Health	[HYPERLINK "http://www.idph.state.il.us/"]
Indiana	Environment	Indiana Department of Environmental Management - IN.gov	[HYPERLINK "http://www.in.gov/idem/"]
Indiana	Occupational Health	IOSHA - IN.gov	[HYPERLINK "http://www.in.gov/dol/iosha.htm"]
Indiana	Environmental Health/Health	Indiana Environmental Health Website	[HYPERLINK "http://www.in.gov/isdh"]
Iowa	Environment	Environmental Protection - Iowa Department of Natural Resources	[HYPERLINK "http://www.iowadnr.gov/"]
Iowa	Occupational Health	Iowa OSHA www.iowadivisionoflabor.gov	[HYPERLINK "http://www.iowaosha.gov/"]
Iowa	Environmental Health/Health	EHS - Home - Iowa Department of Public Health - Iowa.gov	[HYPERLINK "http://www.idph.iowa.gov/ehs"]
Kansas	Environment	Kansas Department of Health & Environment: Division of Environment	[HYPERLINK "http://www.kdheks.gov/environment/"]
Kansas	Occupational Health	Kansas Department of Labor: workplace safety	[HYPERLINK "http://www.dol.ks.gov/Safety"]
Kansas	Environmental Health/Health	Kansas Department of Health & Environment: Division of Public Health	[HYPERLINK "http://www.kdheks.gov/"]
Kentucky	Environment	Department for Environmental Protection Welcome - Kentucky.gov	[HYPERLINK "http://www.dep.ky.gov/"]

Kentucky	Environment	Kentucky Environmental Quality Commission Welcome to the EQC	[HYPERLINK "http://www.eqc.ky.gov/"]
Kentucky	Environment	Energy and Environment Cabinet Welcome - Kentucky.gov	[HYPERLINK "http://www.eec.ky.gov/"]
Kentucky	Occupational Health	Kentucky Labor Cabinet - Occupational Safety and Health Program	[HYPERLINK "http://www.labor.ky.gov/dows /oshp/Pages/Occupational- Safety-and-Health- Program.aspx"]
Kentucky	Environmental Health/Health	Kentucky: Cabinet for Health and Family Services - DPH Home	[HYPERLINK "http://www.chfs.ky.gov/dph/"]
Louisiana	Environment	Louisiana Department of Environmental Quality & HOME	[HYPERLINK "http://www.deq.louisiana.gov/ "]
Louisiana	Environmental Health/Health	About Environmental Health - Louisiana Department of Health and ...	[HYPERLINK "http://www.dhh.louisiana.gov/ "]
Louisiana	Environmental Health/Health	Health Data Portal	[HYPERLINK "http://www.healthdata.dhh.la. gov/"]
Maine	Environment	Maine Department of Environmental Protection (DEP) - Maine.gov	[HYPERLINK "http://www.maine.gov/dep/"]
Maine	Occupational Health	Maine Department of Labor: Workplace Safety and Health - Maine.gov	[HYPERLINK "http://www.maine.gov/labor/w orkplace_safety/"]
Maine	Environmental Health/Health	Division of Environmental Health - Maine CDC: DHHS ... - Maine.gov	[HYPERLINK "http://www.maine.gov/dhhs/m ecdc/environmental-health/el/"]

Maine	Environmental Health/Health	Maine DHHS - Environmental Health - Maine.gov	[HYPERLINK "http://www.maine.gov/dhhs/e nvironmental_health.shtml"]
Maryland	Environment	Maryland Department of the Environment	[HYPERLINK "http://www.mde.state.md.us/"]
Maryland	Occupational Health	Maryland Occupational Safety and Health (MOSH) - Division of ...	[HYPERLINK "http://www.dllr.state.md.us/"]
Maryland	Environmental Health/Health	Environmental Health - Maryland Department of Health and Mental ...	[HYPERLINK "http://www.dhmh.maryland.go v/"]
Maryland	Environmental Health/Health	Environmental Health - Prevention and Health Promotion ...	[HYPERLINK "http://www.phpa.dhmh.maryla nd.gov/"]
Massachusetts	Environment	Massachusetts Department of Environmental Protection MassDEP	[HYPERLINK "http://www.mass.gov/eea/age ncies/massdep/"]
Massachusetts	Occupational Health	Occupational Health Surveillance Program - Mass.Gov	[HYPERLINK "http://www.mass.gov/dph/ohs p"]
Massachusetts	Environmental Health/Health	Environmental Health - Mass.Gov	[HYPERLINK "http://www.mass.gov/eohhs/g ov/departments/dph/programs/ environmental-health/"]
Michigan	Environment	DEQ - Department of Environmental Quality - State of Michigan	[HYPERLINK "http://www.michigan.gov/deq/ "]
Michigan	Occupational Health	MI Occupational Safety & Health Administration - State of Michigan	[HYPERLINK "http://www.michigan.gov/lara/ "]

Michigan	Environmental Health/Health	MDHHS - Public Safety & Environmental Health - State of Michigan	[HYPERLINK "http://www.michigan.gov/mdhhs/"]
Minnesota	Environment	Minnesota Pollution Control Agency	[HYPERLINK "http://www.pca.state.mn.us/"]
Minnesota	Environment	Minnesota Environmental Quality Board	[HYPERLINK "http://www.eqb.state.mn.us/"]
Minnesota	Occupational Health	Minnesota Center for Occupational Health and Safety	[HYPERLINK "http://www.health.state.mn.us/occhealth/"]
Minnesota	Environmental Health/Health	Environmental Health - Minnesota Dept. of Health	[HYPERLINK "http://www.health.state.mn.us/"]
Minnesota	Environmental Health/Health	Environmental Safety - Minnesota.gov	[HYPERLINK "http://www.mn.gov/portal/health-and-safety/environmental-safety/"]
Mississippi	Environment	Mississippi Department of Environmental Quality	[HYPERLINK "http://www.deq.state.ms.us/"]
Mississippi	Occupational Health	Occupational Health - Mississippi State Department of Health	[HYPERLINK "http://www.msdh.ms.gov/"]
Missouri	Environment	Division of Environmental Quality - Missouri Department of Natural ...	[HYPERLINK "http://www.dnr.mo.gov/env"]
Missouri	Occupational Health	Workplace Safety Missouri Labor	[HYPERLINK "http://www.labor.mo.gov/DLS/workplaceSafety"]
Missouri	Environmental Health/Health	Environmental Health Operational Guidelines Missouri Department ...	[HYPERLINK "http://www.health.mo.gov/"]

Missouri	Environmental Health/Health	Missouri Environmental Public Health Tracking	[HYPERLINK "http://www.ephtn.dhss.mo.gov/"]
Missouri	Environmental Health/Health	Environmental Public Health	[HYPERLINK "http://www.kcmo.gov/health/environmental-health-services/e"]
Montana	Environment	Air - Montana DEQ > Home - Montana.gov	[HYPERLINK "http://www.deq.mt.gov/"]
Montana	Occupational Health	Occupational Safety and Health - Employment Relations Division	[HYPERLINK "http://www.erd.dli.mt.gov/safety-health/occupational-safety-and-health"]
Montana	Environmental Health/Health	Environmental Health - DPHHS Home - Montana.gov	[HYPERLINK "http://www.dphhs.mt.gov/publichealth/Environmental-Health"]
Nebraska	Environment	Nebraska Department of Environmental Quality	[HYPERLINK "http://www.deq.state.ne.us/"]
Nebraska	Occupational Health	Department of Labor Office of Safety	[HYPERLINK "http://www.dol.nebraska.gov/Safety/"]
Nebraska	Environmental Health/Health	Nebraska DHHS: Environmental Health	[HYPERLINK "http://www.dhhs.ne.gov/"]
Nevada	Environment	Nevada Division of Environmental Protection	[HYPERLINK "http://www.ndep.nv.gov/"]
Nevada	Occupational Health	Department of Industrial Relations, OSHA	[HYPERLINK "http://www.dir.nv.gov/OSHA/Home/"]

Nevada	Environmental Health/Health	Nevada Division of Public and Behavioral Health - State of Nevada, Environmental Health Section	[HYPERLINK "http://www.dpbh.nv.gov/"]
New Hampshire	Environment	Welcome NH Department of Environmental Services	[HYPERLINK "http://www.des.nh.gov/"]
New Hampshire	Environment	Environmental Protection Bureau NH Department of Justice	[HYPERLINK "http://www.doj.nh.gov/environmental-protection/index.htm"]
New Hampshire	Occupational Health	Occupational Health Surveillance Program at University of New Hampshire, in conjunction with the state	[HYPERLINK "http://www.iod.unh.edu/projects/occupational-health-surveillance-program"]
New Hampshire	Environmental Health/Health	Welcome New Hampshire Environmental Public Health Tracking Program	[HYPERLINK "http://www.nh.gov/epht"]
New Jersey	Environment	NJDEP New Jersey Department of Environmental Protection	[HYPERLINK "http://www.nj.gov/dep"]
New Jersey	Occupational Health and Environmental Health	Department of Health, The Consumer, Environmental and Occupational Health Service	[HYPERLINK "http://www.nj.gov/health/ceohs/"]
New Mexico	Environment	New Mexico Environment Department Home Web Site Homepage ...	[HYPERLINK "http://www.env.nm.gov/"]
New York	Environment	New York State Department of Environmental Conservation	[HYPERLINK "http://www.dec.ny.gov/"]
New York	Occupational Health	NYS Occupational Health Clinic Network - New York State ...	[HYPERLINK "http://www.health.ny.gov/environmental/workplace/"]
North Carolina	Environment	NC DEQ	[HYPERLINK "http://www.deq.nc.gov/"]
North Carolina	Occupational Health	N.C. Department of Labor, Occupational Health Division	[HYPERLINK "http://www.nclabor.com/osh/"]

North Carolina	Environmental Health/Health	State of North Carolina: Environmental Health	[HYPERLINK "http://www.nc.gov/agency/env ironmental-health"]
North Dakota	Environment	Environmental Services - nd.gov: Official Portal for North Dakota ...	[HYPERLINK "http://www.nd.gov/"]
North Dakota	Environment	Environmental and Transportation Services Division - North Dakota ...	[HYPERLINK "http://www.dot.nd.gov/public/ divdist/environmental.htm"]
North Dakota	Environmental Health/Health	Environmental Health Air Quality Section	[HYPERLINK "http://www.ndhealth.gov/aq/"]
North Dakota	Environmental Health/Health	Environmental Health Section - North Dakota Department of Health	[HYPERLINK "http://www.ndhealth.gov/ehs/ "]
Ohio	Environment	Ohio EPA Home	[HYPERLINK "http://www.epa.state.oh.us/"]
Ohio	Occupational Health	Ohio Bureau of Workers Compensation, Division of Safety & Hygiene services	[HYPERLINK "http://www.bwc.ohio.gov/emp loyer/programs/safety/"]
Ohio	Environmental Health/Health	Environmental Health - Ohio Department of Health	[HYPERLINK "http://www.odh.ohio.gov/envir onmentalhealth"]
Oklahoma	Environment	Welcome to the Oklahoma Department of Environmental Quality	[HYPERLINK "http://www.deq.state.ok.us/"]
Oklahoma	Occupational Health	Oklahoma Department of Labor - Safety and Health (PEOSH)	[HYPERLINK "http://www.ok.gov/odol/Servic es/Safety_and_Health_(PEOSH)"]

Oregon	Environment	State of Oregon: Department of Environmental Quality - Home	[HYPERLINK "http://www.oregon.gov/DEQ/"]
Oregon	Occupational Health	State of Oregon: Oregon OSHA - Home	[HYPERLINK "http://www.osha.oregon.gov/"]
Oregon	Environmental Health/Health	Healthy Environments - Oregon Public Health Division - Oregon.gov	[HYPERLINK "http://www.public.health.oregon.gov/HealthyEnvironments"]
Pennsylvania	Environment	Pennsylvania Department of Environmental Protection	[HYPERLINK "http://www.dep.pa.gov/"]
Pennsylvania	Occupational Health	Occupational and Industrial Safety - PA Department of Labor ...	[HYPERLINK "http://www.dli.pa.gov/Individuals/Labor-Management-Relations/bois/Pages/default.aspx"]
Pennsylvania	Environmental Health/Health	Pennsylvania Department of Health	[HYPERLINK "http://www.health.pa.gov/My%20Health/Environmental%20Health/Pages/default.aspx" \l ".WLdHiW_ytJ8"]
Rhode Island	Environment	Home- Rhode Island -Department of Environmental Management	[HYPERLINK "http://www.dem.ri.gov/"]
Rhode Island	Occupational Health	Occupational Safety, Workforce Regulation and Safety, RI ...	[HYPERLINK "http://www.dlt.ri.gov/occusafe/"]
Rhode Island	Environmental Health/Health	Environmental Health, Division of - Rhode Island Department of Health	[HYPERLINK "http://www.health.ri.gov/programs/detail.php?pgm_id=1052"]

South Dakota	Environment	South Dakota Department of Environment and Natural Resources	[HYPERLINK "http://www.denr.sd.gov/"]
South Dakota	Environmental Health/Health	South Dakota Environmental Health Laboratory	[HYPERLINK "http://www.doh.sd.gov/lab/en vironmental/"]
South Carolina	Environment	Environment - SC.gov	[HYPERLINK "http://www.sc.gov/HealthAndS afety/Pages/Environment.aspx"]
South Carolina	Occupational Health	South Carolina Occupational Safety and Health Administration	[HYPERLINK "http://www.scosha.llronline.co m/"]
South Carolina	Environmental Health/Health	S.C. Department of Health & Environmental Control	[HYPERLINK "http://www.scdhec.gov/"]
Tennessee	Environment	Department of Environment & Conservation - State of Tennessee	[HYPERLINK "http://www.tennessee.gov/env ironment/"]
Tennessee	Environment	Division of Water Resources - TN.Gov	[HYPERLINK "http://www.tn.gov/environme nt/section/wr-water-resources"]
Tennessee	Occupational Health	Tennessee Occupational Safety and Health Administration - TN.Gov	[HYPERLINK "http://www.tn.gov/workforce/ section/tosha"]
Tennessee	Environmental Health/Health	Tennessee Department of Health - TN.Gov	[HYPERLINK "http://www.tn.gov/health/secti on/eh"]
Texas	Environment	TCEQ Homepage - TCEQ - www.tceq.texas.gov	[HYPERLINK "http://www.tceq.texas.gov/"]

Texas	Occupational Health	OSHA - Workplace Safety and Health Requirements	[HYPERLINK "http://www.twc.state.tx.us/"]
Texas	Occupational Health	OSHCON: Occupational Safety and Health Consultation Program	[HYPERLINK "http://www.tdi.texas.gov/"]
Texas	Environmental Health/Health	Texas Department of State Health Services, Texas Environmental Health Institute	[HYPERLINK "http://www.dshs.texas.gov/"]
Utah	Environment	Utah Department of Environmental Quality	[HYPERLINK "http://www.deq.utah.gov/"]
Utah	Environment	Utah DEQ: Division of Air Quality	[HYPERLINK "http://www.airquality.utah.gov/"]
Utah	Occupational Health	Utah Occupational Safety and Health	[HYPERLINK "http://www.laborcommission.utah.gov/divisions/UOSH/"]
Utah	Environmental Health/Health	UT-EPHT - Welcome to Utah's Environmental Public Health Tracking ...	[HYPERLINK "http://www.epht.health.utah.gov/"]
Vermont	Environment	Vermont Department of Environmental Conservation	[HYPERLINK "http://www.dec.vermont.gov/"]
Vermont	Environment	Department of Environmental Conservation - Vermont Agency of ...	[HYPERLINK "http://www.anr.vermont.gov/"]
Vermont	Occupational Health	VOSHA Vermont Department of Labor	[HYPERLINK "http://www.labor.vermont.gov/"]
Vermont	Environmental Health/Health	Vermont Department of Health	[HYPERLINK "http://www.healthvermont.gov/"]

Vermont	Environmental Health/Health	Vermont Department of Health	[HYPERLINK "http://www.han.vermont.gov/"]
Virginia	Environment	The Virginia Department of Environmental Quality: Virginia DEQ	[HYPERLINK "http://www.deq.virginia.gov/"]
Virginia	Occupational Health	Office of Occupational Safety and Health Home	[HYPERLINK "http://www.va.gov/vasafety"]
Virginia	Environmental Health/Health	Virginia Department of Health	[HYPERLINK "http://www.vdh.virginia.gov/"]
Washington	Environment	Access Washington - Environment	[HYPERLINK "http://www.access.wa.gov/topics/environment"]
Washington	Environment	Washington State Department of Ecology	[HYPERLINK "http://www.ecy.wa.gov/"]
Washington	Occupational Health	Department of Labor and Industries: Centers of Occupational Health and Education	[HYPERLINK "http://www.cohe.lni.wa.gov/"]
Washington	Environmental Health/Health	Environmental Public Health :: Washington State Department of Health	[HYPERLINK "http://www.doh.wa.gov/"]
West Virginia	Environment	WV Department of Environmental Protection	[HYPERLINK "http://www.dep.wv.gov/"]
West Virginia	Environmental Health/Health	Welcome to the Bureau for Public Health - West Virginia Department ...	[HYPERLINK "http://www.dhhr.wv.gov/bph"]
Wisconsin	Environment	The State of Wisconsin's Environment - Wisconsin Department of ...	[HYPERLINK "http://www.dnr.wi.gov/"]
Wisconsin	Occupational Health	Wisconsin Occupational Health Program Wisconsin Department of ...	[HYPERLINK "http://www.dhs.wisconsin.gov/occupational-health/"]

Wisconsin	Environmental Health/Health		[HYPERLINK "http://www.dhs.wisconsin.gov/ environmental/"]
Wyoming	Environment	DEQ Wyoming Department of Environmental Quality	[HYPERLINK "http://www.deq.state.wy.us/"]
Wyoming	Environment	Air Quality Wyoming Department of Environmental Quality	[HYPERLINK "http://www.deq.wyoming.gov/ "]
Wyoming	Occupational Health		[HYPERLINK "http://www.wyomingworkforc e.org/businesses/osha/"]
Wyoming	Environmental Health/Health	Wyoming Department of Health: Home Page	[HYPERLINK "http://www.health.wyo.gov/"]

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. List of Gray Literature Sources Removed from Search During Curation for Fate, Engineering/Occupational Exposure, Exposure, and Human Health Hazard Topic Areas

Searched ID	Description	URL	Reason
1007	Office of Water Effluent Guidelines	[HYPERLINK "https://www.epa.gov/eg"]	Provides a list of chemicals only
1009	Water Quality Criteria 1986		Outdated
1018	Government Publishing Office (GPO)	[HYPERLINK "https://www.gpo.gov/"]	Search this last because most hits will be duplicates
1077	Greener products and services	[HYPERLINK "https://www.epa.gov/greenerproducts/identify-greener-products-and-services"]	Public fact sheets without sufficient level of detail
1089	ECOTOX Database	[HYPERLINK "https://cfpub.epa.gov/ecotox/quick_query.htm"]	Removed because ecotox team is covering this reference
1121	US EPA Resources	Fact Sheets	Public fact sheets without sufficient level of detail
1123	EPA Reports	Search epa.gov for each chemical with the key word "report"; only keep those that wouldn't be caught by other sources	Other searches caught this information
1125	EPA Manufacturing/Use	Search epa.gov for each manufacturing sector and use and key words "fact sheet" or "report"	Other searches caught this information
1130	Substance Registry Services (SRS)	[HYPERLINK "https://iaspub.epa.gov/sor_internet/registry/substreg/search.do"]	Site provides links to other trusted sources; was used to ensure no part of SRS was excluded from overall trusted source list
1142	EPA Existing Chemicals Engineering Files	EPA has an archive of hardcopy engineering assessments from previous Existing Chemicals assessments. If directed by the EPA Task Manager, ERG will contact the EPA WA COR to inquire as to the location of these hardcopy files and will review them for relevant information.	This information is internal to OPPT and not public; it may be searched in the future
2023	NTP National Toxicology Program	[HYPERLINK "https://ntp.niehs.nih.gov/"]	Too general; refined search strategy to target specific subsites
2024	NTP National Toxicology Program - Search	[HYPERLINK "http://ntpsearch.niehs.nih.gov/"]	Too general; refined search strategy to target specific subsites
2025	NTP National Toxicology Program - Substances studied by NTP	[HYPERLINK "https://ntp.niehs.nih.gov/testing/status/agents/ts-11297-e.html"]	All NTP studies are captured in Toxline

2033	NTP Genetically Modified Model Report Series	[HYPERLINK "https://ntp.niehs.nih.gov/testing/types/altmodels/reports/index.html"]	All NTP studies are captured in Toxline
2034	NTP Technical Report Series	[HYPERLINK "https://ntp.niehs.nih.gov/results/pubs/longterm/reports/longterm/index.html"]	All NTP studies are captured in Toxline
2035	NTP Toxicity Report Series	https://ntp.niehs.nih.gov/results/pubs/shortterm/reports/index.html	All NTP studies are captured in Toxline
2036	NTP Developmental Toxicity Study Abstracts	https://ntp.niehs.nih.gov/testing/types/dev/abstracts/index.html	All NTP studies are captured in Toxline
2037	NTP Immunotoxicity Study Abstracts	https://ntp.niehs.nih.gov/testing/types/imm/abstracts/index.html	All NTP studies are captured in Toxline
2038	NTP Reproductive Assessment by Continuous Breeding Study Abstracts	https://ntp.niehs.nih.gov/testing/types/repro/abstracts/index.html	All NTP studies are captured in Toxline
2040	NTP- Chemical Effects in Biological Systems (CEBS) database	[HYPERLINK "https://tools.niehs.nih.gov/cebs3/ui/"]	All NTP studies are captured in Toxline
2102	CDC ATSDR Public Health Statements	[HYPERLINK "https://www.atsdr.cdc.gov/phs/phs.asp?id=953&tid=199"]	Already covered by the ATSDR tox profiles in ID 2100
2112	CDC NHANES	https://www.cdc.gov/nchs/nhanes/	Other searches caught this information
2124	CDC NIOSH	[HYPERLINK "https://www.cdc.gov/niosh/npg/search.html"]	A targeted NIOSH search was done instead
2126	CDC NIOSH Pocket Guide to Chemical Hazards	[HYPERLINK "https://www.cdc.gov/niosh/npg/search.html"]	Already covered under ID 2116 (Pocket guide to chemical hazards)
2201	Bureau of Labor Statistics: American Time Use Survey	[HYPERLINK "https://www.bls.gov/tus/tables.htm"]	Does not provide chemical-specific information and is already incorporated into OPPT generic exposure scenarios
2209	Census Bureau: American Fact Finder Database	[HYPERLINK "https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t"]	Does not provide chemical-specific information and is already incorporated into OPPT generic exposure scenarios
2225	Electronic Code of Federal Regulations	http://www.ecfr.gov/	This provides regulatory information only
2401	OSHA Permissible Exposure Limits Table Z-1	https://www.osha.gov/dsg/annotated-pels/tablez-1.html	Other searches caught this information

2402	OSHA Permissible Exposure Limits Table Z-2	https://www.osha.gov/dsg/annotated-pels/tablez-2.html	Other searches caught this information
2403	OSHA Permissible Exposure Limits Table Z-3	https://www.osha.gov/dsg/annotated-pels/tablez-3.html	Other searches caught this information
2503	NOAA National Oceanic and Atmospheric Administration	[HYPERLINK " http://www.noaa.gov "]	Data provided in cameo database already
2508	US International Trade Commission	https://www.usitc.gov/	Provides export information, which is not on topic for this search
2510	USGS US Geological Survey, National Water Information System	[HYPERLINK " http://waterdata.usgs.gov/nwis "]	Included in EPA OPPT monitoring database
2511	CDC National Report on Human Exposure to Environmental Chemicals	[HYPERLINK " https://www.cdc.gov/exposurereport/index.html "]	Moved from automated to manual search
3050	ECHA	[HYPERLINK " https://echa.europa.eu/ "]	Too general; refined search strategy to target specific subsites
3056	Japan NITE CHEmicals Collaborative Knowledge database	http://www.safe.nite.go.jp/jcheck/search.action?request_locale=en	Other searches caught this information
3075	International Resources	https://echa.europa.eu/registration-dossier/	Other searches caught this information
3149	OECD	http://webnet.oecd.org/CCRWEB/Search.aspx	This is captured by the echemportal.org site which also provides record for Japan, Finland, Australia, The Netherlands
3154	OECD eChemPortal	[HYPERLINK " http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en "]	This is a duplicate
3255	WHO International Program on Chemical Safety (UN)	http://www.who.int/ipcs/en/	These data appear in inchem, which is in echemportal
3400	Environment Canada	http://www.ec.gc.ca/default.asp?lang=En&n=FD9B0E51-1	Chemical Substances page links to relevant pages at this site
3411	Health Canada	http://www.hc-sc.gc.ca/index-eng.php	Chemical Substances page links to relevant pages at this site
3430	Government of Alberta, Canada	[HYPERLINK " http://work.alberta.ca "]	Other provinces were not searched, so this was eliminated for consistency
3500	Japan Chemical Risk Information Platform (CHIRP)	http://www.nite.go.jp/en/chem/chrip/chrip_search/systemTop	Other searches caught this information
5002	Toxic Use Reduction Institute	[HYPERLINK " http://www.turi.org "]	Links back to regulatory documents captured in other sources

5005	Environmental Fate Database (EFDB)	http://www.srcinc.com/what-we-do/efdb.aspx	No longer exists
5004	SRI International	-	Paid access to market reports only
5006	SRC FatePointers Search Module PHYSPROP	http://esc.syrres.com/fatepointer/search.asp	Provides information captured in other sources
5010	ChemSpider	http://www.chemspider.com	Not needed since we have chemidplus
5012	inchem	inchem.org	Captured in 5011 results echemporal
5015	ITER	iter.ctc.com/publicURL/pub_search_list.cfm	Provides information captured in other sources
5017	Global Science Gateway	http://www.worldwidescience.org	Other searches caught this information
5018	Cambridge University	http://www-jmg.ch.cam.ac.uk/cil/SGTL/database/	Access only granted to Cambridge researchers and students
5022	Lowell Center for Sustainable Production	http://www.chemicalspolicy.org/chemicalspolicy.us.state.database.php	Only provides regulatory information
5023	ACGIH	Search the ACGIH handbook to determine whether ACGIH Threshold Limit Value (TLV) has been established for specific chemicals of interest	Only provides regulatory information
5024	Pollution Prevention Reference Manual	[HYPERLINK "http://infohouse.p2ric.org/"]	Other searches caught this information
7264	ASTM International	[HYPERLINK "http://www.astm.org/"]	Paid access to standard methods only
7381	IHS Market	[HYPERLINK "http://www.ihs.org/"]	Paid access to market reports only
7467	American Coatings Association	[HYPERLINK "http://www.paint.org/"]	Documents restricted to members only
	Regulations.gov	regulations.gov	Assumed that technical support documents will be caught using other methods
	Federal Register	[HYPERLINK "http://www.federalregister.gov/"]	Assumed that technical support documents will be caught using other methods

D. LITERATURE SEARCHES FOR ENVIRONMENTAL HAZARD

The sources searched in the environmental hazard literature search are provided in [REF _Ref482713451 \h]. The specific search strategies are provided in the remainder of Appendix [REF _Ref482714503 \r \h].

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Sources Used for Gray Literature Search for the Ecotoxicity Topic Area

Trusted Source Category	Source	Manual or Automated?	Searched By:	Keywords	Source Address
Other US Agencies	eChemPortal	Manual	Chemical	CAS Number or chemical name	[HYPERLINK "http://www.echemportal.org/echemportal/participant/page.action?pageId=9"]
International Resources	OECD HPV/SIDS/IUCLID	Manual	Chemical	CAS Number or chemical name	[HYPERLINK "http://webnet.oecd.org/hpv/ui/Search.aspx"]
International Resources	ECHA information on Registered Substances	Manual	Chemical	CAS Number or chemical name	[HYPERLINK "http://echa.europa.eu/information-on-chemicals/registered-substances"]
International Resources	ECHA Information from the Existing Substances Regulation (ESR)	Manual	Chemical	CAS Number or chemical name	[HYPERLINK "http://echa.europa.eu/information-on-chemicals/information-from-existing-substances-regulation"]
International Resources	Environment Canada	Manual	Chemical	CAS Number or chemical name	[HYPERLINK "http://www.ec.gc.ca/default.asp?lang=En&n=ECD35C36"]
International Resources	Environment Canada: Toxic Substances Managed Under CEPA	Manual	Chemical	CAS Number or chemical name	[HYPERLINK "http://www.ec.gc.ca/toxiques-toxics/Default.asp?lang=En&n=98E80CC6-1"]
International Resources	Environment Canada: Draft and Final CEPA Assessments	Manual	Chemical	CAS Number or chemical name	[HYPERLINK "http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&xml=09F567A7-B1EE-1FEE-73DB-8AE6C1EB7658"] [HYPERLINK "http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&xml=6892C255-5597-C162-95FC-4B905320F8C9"]

A. Chemical verification process

1. Verify the chemical substance using chemical verification sources as noted in the *ECOTOX Chemical Verification and Entry Procedure* ([HYPERLINK "https://cfpub.epa.gov/ecotox/help.cfm?helptabs=tab4"]).

Chemical verification ensures that the chemical name and CAS Number for the chemical substance linked and correct. Chemical verification sources are searched by the name and/or CAS Number and are cross-checked to ensure the chemical name - CAS Number relationship is valid. Additional information including synonyms and molecular formulas are also located in the verification sources. Once the name and CAS Number have been verified, they are entered into the U.S.EPA's ECOTOX chemical file for use. The primary source for chemical verification is STN International, <http://www.stn-international.com> (operated by Chemical Abstract Services) and contains information on all classes of chemicals, organic, pesticides, inerts, solvents, etc. The chemical verification sources include:

- Online Databases, e.g. STN International (<http://www.stn-international.com>)
 - Chemical Compendiums, e.g. Dictionary of Organic Chemicals, Registry of Toxic Effects of Chemical Substances
 - Chemical Catalogs, e.g. Sigma-Aldrich (<https://www.sigmaaldrich.com>)
 - Internet websites, e.g. company websites displaying chemical MSDS and label Information
2. Find related chemicals that may be of interest to OPPT RAD (the relationship of the chemicals are noted in [REF_Ref482713649 \h * MERGEFORMAT], column headed Relationship, e.g. Parent, is the chemical substance requested, Degradates (chemicals formed as the chemical substance is degraded), and Related compounds (similar in structure to the chemical substance requested, e.g. isomers)), if located. Synonym names and trade names to include in the literature search strategy are also located. Sources for related chemicals and synonym chemical names are at:
 - PAN: The Pesticide Action Network (<http://www.pesticideinfo.org>) is a site that provides information about pesticides and also includes inerts and solvents used in chemical formulations. After entering a name or CAS number into the search field, choose the chemical of interest from the search results and scroll down to the bottom of the page. Related chemicals will be listed here along with a reason. Parent chemicals, derivatives, and degradates/metabolites can be found here.
 - PFATE: EPA's Pesticide Fate Database (located at the contractor's site) is a database that provides degradates for chemicals, mostly pesticides. Searching on a chemical name returns associated degradates.
 - DOC: Dictionary of Chemical Names and Synonyms for synonym names. STN should also be used for the synonym search if a search was conducted to verify the chemical.
 - ECOTOX: Search the U.S. EPA's ECOTOX chemical database for chemical synonyms and

related chemicals. (www.epa.gov/ecotox)

- Additional chemical verification sources, if needed from Appendix A from the *ECOTOX Chemical Verification and Entry Procedure* ([[HYPERLINK "https://cfpub.epa.gov/ecotox/help.cfm?helptabs=tab4"](https://cfpub.epa.gov/ecotox/help.cfm?helptabs=tab4)]) contains a list of approved sources of verification for chemical names and structures. Common sources searched may include:
 - Registry of Toxic Effects of Chemical Substances
 - TSCA Chemical Substances Inventory
 - Compendium of Pesticide Common Names
 - California Department of Pesticide Regulation
- If the chemical cannot be found on these websites or any other approved sources, an Internet search is performed to locate additional information.

B. UNIFY Chemical Report Setup Worksheet

Step 1. Identifying the chemical name(s), CAS number(s) and related chemicals. If related chemicals are located, add a line [REF _Ref482713649 \h].

Chemical requested: Carbon Tetrachloride

STN International (STN) - [[HYPERLINK "http://www.stn-international.com"](http://www.stn-international.com)]

CAS # 56-23-5

Methane, tetrachloro-
Carbon tetrachloride (8Cl)
Tetrachloromethane
1,1,1,1-Tetrachloromethane
Benzinoform
Carbon chloride (CCl4)
Carbona
CC m0
Flukoids
Halon 1040
Necatorina
NSC 97063
Perchloromethane
Phenixin
Phenoxin
R 10
Tetrafinol
Tetraform
Tetrasol

Univerm
Vermoestricid

Pesticide Action Network (PAN) - [[HYPERLINK "http://www.pesticideinfo.org/"](http://www.pesticideinfo.org/)]

Carbon Tetrachloride – 56-23-5 (Parent compound)

Chemical Uses: PAN – not listed

(US EPA PC Code) , (US EPA PC Code) , 016501 (US EPA PC Code Text) , 109 (CA DPR Chem Code) , 56-23-5 (CAS number) , 56235 , 56235 (CAS number without hyphens) , 816501 (US EPA PC Code Text) , Acritet (Use 2 code nos. 000601 and 016501) , Acritet (Use 2 EPA PC code nos. 000601 and 016501) , Carbon tetrachloride , Carbon tetrachloride (NO INERT USE) , CARBON TETRACHLORIDE (CA DPR Chem Code Text) , Carbontetrachloride , ENT 4705 , Methane, tetrachloro- , Perchloromethane , Tetrachloromethane , Ventox (Use 2 code nos. 000601 and 016501) , Ventox (Use 2 EPA PC code nos. 000601 and 016501)

PFATE

No additional or related chemical information located.

ECOTOX Chemical database

Contains "Carbon Tetrachloride"

No additional or related chemical information located.

Online - [[HYPERLINK "http://eawag-bbd.ethz.ch/ctc/ctc_map.html"](http://eawag-bbd.ethz.ch/ctc/ctc_map.html)]

Related Chemical: Thiophosgene, CAS# 463-71-8

Related Chemical: Phosgene, CAS# 75-44-5

Related Chemical: Chloroform, CAS# 67-66-3

Related Chemical: Dichloromethane, CAS# 75-09-2

Related Chemical: Methyl Chloride, CAS# 74-87-3

Related Chemical: Methane, CAS# 74-82-8

Related Chemical: Carbon Monoxide, CAS# 630-08-0

Related Chemical: Formate, CAS# 64-18-6

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Chemical(s) located for Carbon Tetrachloride (CCL4)

* Related compounds were to be included in the search.

Chemical Name	CAS #	Relationship (Parent, Degradate, etc.) and Source
Carbon Tetrachloride	56235	Parent (PAN)
*Thiophosgene	463718	Related (Online)
*Phosgene	75445	Related (Online)
*Chloroform	67663	Related (Online)
*Dichloromethane	75092	Related (Online)

*Methyl Chloride	74873	Related (Online)
*Methane	74828	Related (Online)
*Carbon Monoxide	630080	Related (Online)
*Formate	64186	Related (Online)

Step 2. Create a unique list of Chemical Search Terms

From the searches conducted in Step 1, chemical terms from searches are listed below, create a unique list of chemical terms to be used for the Chemical Substance literature search. Non-English, long scientific chemical names and terms documented to cause false hits are not used and are not in bold. Note that if one term is part of another term, e.g. Tetrachloromethane and 1,1,1,1-Tetrachloromethane, only the first term is used, e.g. Tetrachloromethane. Terms used to generate the final list of chemical terms are in **BOLD**.

1. STN

Methane, tetrachloro-
Carbon tetrachloride (8CI)
Tetrachloromethane
 1,1,1,1-Tetrachloromethane
Benzinoform
Carbon chloride (CCI4)
 Carbona
CC m0
Flukoids
Halon 1040
Necatorina
NSC 97063
Perchloromethane
Phenixin
 Phenoxin
 R 10
Tetrafinol
Tetraform
Tetrasol
Univerm
Vermoestricid

Related Chemicals from STN (not to be included in the search per email from Tracy Wright on 1/13/2017)

463-71-8

Carbonothioic dichloride
Thiophosgene (6Cl, 8Cl)
Carbon chlorosulfide
Carbon dichloride sulfide
Carbonic dichloride, thio-
Carbonyl sulfide dichloride
Dichlorothiocarbonyl
Dichlorothioformaldehyde
Thiocarbonic dichloride
Thiocarbonyl chloride
Thiocarbonyl dichloride

75-44-5

Carbonic dichloride
Phosgene (8Cl)
Carbon dichloride oxide
Carbon oxychloride
Carbonyl chloride
Carbonyl dichloride
CG
Chloroformyl chloride
Dichloroformaldehyde
Phosgen

67-66-3

Methane, trichloro-
Chloroform (8Cl)
Trichloromethane
F 20
HCC 20
NSC 77361
R 20
Trichloroform

75-09-2

Methane, dichloro-
Dichloromethane
Aerothene MM
DCM
F 30
Freon 30
HCC 30
Khladon 30
Metaclen
Methane dichloride

Methylene chloride
Methylene dichloride
Narkotil
NSC 406122
R 30
Solaesthin
Soleana VDA
Solmethine

74-87-3
Methane, chloro-
Chloromethane
Artic
Chloromethane dimer
F 40
HCC 40
Methyl chloride
Monochloromethane
R 40

74-82-8
Methane
Marsh gas
Methyl hydride
R 50

2. PAN

(US EPA PC Code) , (US EPA PC Code) , 016501 (US EPA PC Code Text) , 109 (CA DPR Chem Code)) ,
56-23-5 (CAS number) , 56235 , 56235 (CAS number without hyphens) , 816501 (US EPA PC Code Text)
, Acritet (Use 2 code nos. 000601 and 016501) , Acritet (Use 2 EPA PC code nos. 000601 and 016501) ,
Carbon tetrachloride , Carbon tetrachloride (NO INERT USE) , CARBON TETRACHLORIDE (CA DPR Chem
Code Text) , Carbontetrachloride , ENT 4705 , Methane, tetrachloro- , Perchloromethane ,
Tetrachloromethane , Ventox (Use 2 code nos. 000601 and 016501) , Ventox (Use 2 EPA PC code nos.
000601 and 016501)

Final chemical terms to use for the Chemical Substance Literature search derived from the chemical lists above.

CAS Number(s):

56-23-5

Chemical Names:

Benzinoform
Carbon chloride
Carbon tetrachloride
CC m0
Flukoids
Halon 1040
Necatorina
NSC 97063
Perchloromethane
Phenixin
Tetrachloromethane
Tetrafinol
Tetraform
Tetrasol
Univerm
Vermoestricid

GENERAL: *These are the search terms compiled from the Chemical Report for Carbon Tetrachloride to be used in the search strategies for each of the databases listed below.*

Carbon tetrachloride OR Tetrachloromethane OR Benzinoform OR Carbon chloride OR Flukoids OR Halon 1040 OR Necatorina OR NSC 97063 OR Perchloromethane OR Phenixin OR Tetrafinol OR Tetraform OR Tetrasol OR Univerm OR Vermoestricid

Based upon the online search manuals for the respective databases below, it was necessary to construct searches as follows:

SCIENCE DIRECT: (www.sciencedirect.com) *General Search Terms applied to the search strategy for Science Direct*

Date Searched: 01/13/2017

Date Range of Search: 1823 to Present

N=3299

Tak("Carbon tetrachloride" OR Tetrachloromethane OR Benzinoform OR "Carbon chloride" OR Flukoids OR "Halon 1040" OR Necatorina OR "NSC 97063" OR Perchloromethane OR Phenixin OR Tetrafinol OR Tetraform OR Tetrasol OR Univerm OR Vermoestricid) AND NOT key(human* or child* or occupat* OR infant* OR homind* OR woman OR women OR patient* OR OSHA OR chromatograph* OR Spectrometr* OR pediatric*)

AGRICOLA: (www.nal.usda.gov) *General Search Terms applied to the search strategy for Agricola. The Agricola database contains a significant amount of gray literature including proceedings, symposia, and progress reports from government and educational institutions. This database categorizes literature as an "article" or a "book."*

Date Searched: 01/13/2017

Date Range of Search: 15th Century to Present

N=1150

Agricola limits the search to 383 characters and therefore it is searched in sections to cover all of the compiled General Terms.

Articles:

"Carbon tetrachloride" OR Tetrachloromethane OR Benzoinform OR "Carbon chloride" OR Flukoids OR "Halon 1040" OR Necatorina OR "NSC 97063" OR Perchloromethane OR Phenixin OR Tetrafinol OR Tetraform OR Tetrasol OR Univerm OR Vermoestricid

Search Results: Displaying 1 through 100 of 1130 entries.

Books:

"Carbon tetrachloride" OR Tetrachloromethane OR Benzoinform OR "Carbon chloride" OR Flukoids OR "Halon 1040" OR Necatorina OR "NSC 97063" OR Perchloromethane OR Phenixin OR Tetrafinol OR Tetraform OR Tetrasol OR Univerm OR Vermoestricid

Search Results: Displaying 1 through 20 of 20 entries.

TOXNET: (toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?TOXLINE) *General Search Terms applied to the search strategy for TOXNET.*

Date Searched: 01/13/2017

Date Range of Search: 1900 to Present

N=10763

TOXNET:

56-23-5

PROQUEST CSA: (www.csa.com) *General Search Terms applied to the search strategy for ProQuest CSA.*

Date Searched: 01/13/2017

Date Range of Search: 1900 to Present

N=1107

ALL("Carbon tetrachloride" OR Tetrachloromethane OR Benzoinform OR "Carbon chloride" OR Flukoids OR "Halon 1040" OR Necatorina OR "NSC 97063" OR Perchloromethane OR Phenixin OR Tetrafinol OR Tetraform OR Tetrasol OR Univerm OR Vermoestricid) AND STYPE("Scholarly Journals" OR Reports OR Thesis OR "Government Documents") AND(su(toxicity OR toxicology OR bioassay* or lethal OR bioaccum*) OR cc(01504 or 08504 or "D 047*" or "X 241*") OR (LC NEAR/3 50)) NOT IF(m?n or human* or child* or occupant* or infant* or wom?n or patient* or pediatric) AND LA(ENG)

PROQUEST DISSABS: (search.proquest.com) *General Search Terms applied to the search strategy for ProQuest DISSABS.*

Date Searched: 01/13/2017

Date Range of Search: 1900 to Present

N=151

ALL("Carbon tetrachloride" OR Tetrachloromethane OR Benzinoform OR "Carbon chloride" OR Flukoids OR "Halon 1040" OR Necatorina OR "NSC 97063" OR Perchloromethane OR Phenixin OR Tetrafinol OR Tetraform OR Tetrasol OR Univerm OR Vermoestricid) NOT IF(m?n or human* or child* or occupant* or infant* or wom?n or patient* or pediatric) AND LA(ENG)

CURRENT CONTENTS: (<https://access.webofknowledge.com/>) *General Search Terms applied to the search strategy for Current Contents.*

Date Searched: 01/13/2017

Date Range of Search: 1970 to Present

N=4681

TS=("Carbon tetrachloride" OR Tetrachloromethane OR Benzinoform OR "Carbon chloride" OR Flukoids OR "Halon 1040" OR Necatorina OR "NSC 97063" OR Perchloromethane OR Phenixin OR Tetrafinol OR Tetraform OR Tetrasol OR Univerm OR Vermoestricid)

ECOTOX (production.ecodev.csgov.com/unify/) *Results from the ECOTOX search strategy. These results are derived from the publications that are available in the ECOTOX database. This website is not accessible to the public.*

Date Searched: 01/13/2017

Date Range of Search: 01/01/1900 to 01/13/2017

N=0

The two sources listed below are used if very few articles are identified in the searches above. The two sources listed below have very high non-applicability rates and not cost effective in most cases.

SCIFINDER: (www.cas.org/)

SciFinder search was not run.

PUB MED: (www.ncbi.nlm.nih.gov/PubMed/)

PubMed search was not run.

E. TAGS WITH INCLUSION/EXCLUSION CRITERIA

E-1 Inclusion/Exclusion Criteria and Tags for the Fate Literature

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Tags and Inclusion/Exclusion Criteria for Carbon Tetrachloride (CCL4) for the Fate Topic Area

Tag	Inclusion/Exclusion Criteria	Example Keywords
ON TOPIC, GENERAL FATE TAGS		
Fate and Transport Data	<p>INCLUDE:</p> <ul style="list-style-type: none"> Studies providing pchem property data that describe/impact fate and transport <p>EXCLUDE:</p> <ul style="list-style-type: none"> Laboratory experiments using laboratory-derived chemicals or laboratory simulations, not using environmental samples, unless rate constant or coefficient is derived; Laboratory experiments using environmental sample under non-natural conditions or added substrates, not naturally occurring in environment 	KoA, Kow, KAw, Koc, Kd, partitioning coefficient, fugacity, flux, groundwater, migration, sediment, leach, soil, sorb, sorption, adsorption, dust, particles, aerosol, volatility, solubility
Environmental Persistence	<p>INCLUDE:</p> <ul style="list-style-type: none"> Studies that indicate persistence, transformation, and degradation in the environment 	Persistence, half-life, hydrolysis, photolysis, photostability, biodegradation, aerobic, anaerobic, metabolism, reduction, degradation, transformation
Bioaccumulation	<p>INCLUDE:</p> <ul style="list-style-type: none"> studies pertaining to bioaccumulation, bioconcentration, and trophic magnification <p>EXCLUDE:</p> <ul style="list-style-type: none"> Studies where chemical is given to animal in lab setting where conditions where conditions are clearly not relevant to naturally-occurring conditions Studies in humans, these can fall under Human Health, ADME 	BCF, BAF, BSAF, trophic magnification, biomagnification, bioaccumulation, bioconcentration, biota sediment accumulation factor, biotransfer
Wastewater Removal	<p>INCLUDE:</p> <ul style="list-style-type: none"> sewage or wastewater treatment, treatment facilities, and effluent 	Sewage or wastewater treatment, WWTP, POTW, sludge, effluent

	EXCLUDE: <ul style="list-style-type: none"> test systems, laboratory experiments, or demonstrations where conditions are clearly not relevant to naturally-occurring conditions 	
Other supporting fate and transport	INCLUDE: <ul style="list-style-type: none"> studies supporting or possibly supporting fate and transport, but not a study that can be included in one or more of the preceding relevant categories 	
ON TOPIC, GENERAL STUDY TAGS		
Data Type	INCLUDE: Empirical Modeled	Empirical: measured Modeled: simulated, estimated, modeled
Source Type	INCLUDE: Database Search Gray Literature <ul style="list-style-type: none"> EPA Source Other Government Source Industry-Specific Source Peer-reviewed Literature Direct Communications Primary Source Secondary Source	Determination of source type of database search or gray literature is by search type, rather than keyword. Primary Source: Novel, experimental, modeling Secondary Source: Review
Use Specific	INCLUDE: Source contains use-specific data or information	petrol, lubricants, refrigerants, asphalt
Chemical Specific	INCLUDE: Source contains information specific to the chemical of interest	CCL4 and synonyms
Regulatory	INCLUDE: Source contains a regulatory value/limit	Water quality criteria, NAAQS ² , IRIS ²
OFF TOPIC		
Off Topic	INCLUDE: Off topic in context of identified information needs	
OTHER		
Not peer-reviewed	INCLUDE: Published without formal peer review. Use in addition to relevant or not relevant (not an exclusive tag).	
Foreign language	INCLUDE:	

	Full-text published in non-English language. Use in addition to relevant or not relevant (not an exclusive tag).	
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¹National Ambient Air Quality Standard

²Integrated Risk Information System

E-2 Inclusion/Exclusion Criteria and Tags for the Engineering/Occupational Exposure Literature

Table_Apx [STYLREF 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Tags and Inclusion/Exclusion Criteria for Carbon Tetrachloride (CCL4) for the Engineering/Occupational Exposure Topic Area

Tag	Inclusion/Exclusion Criteria	Example Keywords
ON TOPIC, GENERAL ENGINEERING/OCCUPATIONAL EXPOSURE TAGS		
Process Info	INCLUDE: <ul style="list-style-type: none"> Studies pertaining to chemical processes containing information on life cycle, production volume, descriptions of processes, and manufacturing sites EXCLUDE: <ul style="list-style-type: none"> Studies involving Superfund sites, these might fall under Exposure 	Life cycle, production volume, use volume, import, process description, process flow diagram, product concentration, sites, manufacture, process
Occupational Exposure	INCLUDE: <ul style="list-style-type: none"> Occupational exposure studies that contain or may contain information on worker activities, amount of workers exposed, routes of exposure, personal and work area monitoring data (job titles), exposure modeling, and/or interventions to reduce exposure such as PPE or engineering controls 	Worker, worker activities, worker exposure, occupational exposure, inhalation, dermal, personal sample, time-weighted average, breathing zone, PPE, personal protective equipment, engineering controls, exposure reduction, ventilation
Environmental Releases	INCLUDE: <ul style="list-style-type: none"> Studies pertaining to releases from manufacturing waste streams and end of life cycle processing 	Release, emission, release rate, release frequency, point source, area source, air, water, landfill, incineration, POTW, on-site treatment, disposal, pretreatment program, recycling, air concentration
Other supporting	INCLUDE: <ul style="list-style-type: none"> Studies supporting or possibly supporting engineering sections, but <u>not</u> a study included in one or more of the preceding relevant categories 	
ON TOPIC, GENERAL STUDY TAGS		
Data Type	INCLUDE: Empirical Modeled	Empirical: measured Modeled: simulated, estimated, modeled
Source Type	INCLUDE: Database Search Gray Literature <ul style="list-style-type: none"> EPA Source Other Government Source Industry-Specific Source 	Determination of source type of database search or gray literature is by search type, rather than keyword. Primary Source: Novel, experimental, modeling Secondary Source: Review

	<ul style="list-style-type: none"> ○ Peer-reviewed Literature ○ Direct Communications Primary Source Secondary Source	
Use Specific	INCLUDE: Source contains use-specific data or information	petrol, lubricants, refrigerants, asphalt
Chemical Specific	INCLUDE: Source contains information specific to the chemical of interest	CCL4 and synonyms
Regulatory	INCLUDE: Source contains a regulatory value/limit	Water quality criteria, NAAQS ² , IRIS ²
OFF TOPIC		
Off topic	INCLUDE: Off topic in context of identified information needs	
OTHER		
Not peer-reviewed	INCLUDE: Published without formal peer review. Use in addition to relevant or not relevant (not an exclusive tag).	
Foreign language	INCLUDE: Full-text published in non-English language. Use in addition to relevant or not relevant (not an exclusive tag).	

¹National Ambient Air Quality Standard

²Integrated Risk Information System.

E-3 Inclusion/Exclusion Criteria and Tags for the Exposure Literature

Table_Apx [STYLREF 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Exposure Inclusion/Exclusion Criteria Carbon Tetrachloride (CCL4) and Tags

Tag	Inclusion/Exclusion Criteria	Example Keywords
ON TOPIC, GENERAL EXPOSURE TAGS		
Ecological	<p>INCLUDE:</p> <ul style="list-style-type: none"> Covers ecological exposure, including exposure to flora and fauna <p>EXCLUDE:</p> <ul style="list-style-type: none"> Studies limited to describing concentrations in mineral deposits only Pchem properties of environmental sample or chemical structure without concentration data 	concentration, mammal, avian, fish, aquatic
General Population	<p>INCLUDE:</p> <ul style="list-style-type: none"> Covers exposure to the general population due to ambient concentrations in environmental media/food <p>EXCLUDE:</p> <ul style="list-style-type: none"> Studies involving exposures to laboratory-produced chemical or chemical mixture in a lab setting, rather than environmentally-derived samples Studies without measured or modeled concentrations Studies involving measured dust concentrations from consumer products, these should be tagged to Consumer Exposure 	general population exposure/dose, releases, background levels, ambient/outdoor air, deposition, surface water, drinking water, ground water, soil, sediment, sludge, disposal, life cycle
Consumers	<p>INCLUDE:</p> <ul style="list-style-type: none"> Covers exposure to consumers who use a product or article containing the chemical <p>EXCLUDE:</p> <ul style="list-style-type: none"> Studies involving exposures to laboratory-produced chemical, rather than environmentally-derived samples 	consumer product exposure/dose, indoor/residential, product, article, aerosol, dust, indoor air, hand-to-mouth, surface, shower, dermal loading

Susceptible Population	INCLUDE: <ul style="list-style-type: none"> Covers exposure for a particular potentially exposed and susceptible subpopulation 	susceptible/sensitive subpopulation, infants, children, pregnancy, senior, aged, elderly, older women, men, gender, immunocompromised, diseased population, preexisting disease, genetics, socioeconomic status, race
Highly Exposed Population	INCLUDE: <ul style="list-style-type: none"> Covers a population exposed at a level higher than the general population 	highly-exposed sub population, near-facility population, higher-than-average exposure, above background, populations near manufacturing facilities
Other Exposure	INCLUDE: <ul style="list-style-type: none"> Mentions uses or regulatory limits but does not contain exposure values/estimates; tag also to regulatory or use-specific if applicable Studies supporting or possibly supporting exposure sections, but <u>not</u> a study included in one or more of the preceding relevant categories 	
ON TOPIC, GENERAL STUDY TAGS		
Data Type	INCLUDE: Empirical Modeled	Empirical: measured Modeled: simulated, estimated, modeled
Source Type	INCLUDE: Database Search Gray Literature <ul style="list-style-type: none"> EPA Source Other Government Source Industry-Specific Source Peer-reviewed Literature Direct Communications Primary Source Secondary Source	Determination of source type of database search or gray literature is by search type, rather than keyword. Primary Source: Novel, experimental, modeling Secondary Source: Review
Use Specific	INCLUDE: Source contains use-specific data or information	petrol, lubricants, refrigerants, asphalt
Chemical Specific	INCLUDE: Source contains information specific to the chemical of interest	CCL4 and synonyms
Regulatory	INCLUDE: Source contains a regulatory value/limit	Water quality criteria, NAAQS ² , IRIS ³
OFF TOPIC		
Off topic	INCLUDE: Off topic in context of identified information needs	
Human Health	INCLUDE:	

	Contains information that is potentially on-topic for the human health hazard topic area	
OTHER		
Not peer-reviewed	INCLUDE: Published without formal peer review. Use in addition to relevant or not relevant (not an exclusive tag).	
Foreign language	INCLUDE: Full-text published in non-English language. Use in addition to relevant or not relevant (not an exclusive tag).	

¹Ecological search results may overlap with environmental hazard search results. EPA intends to harmonize results during the refinement phase.

²National Ambient Air Quality Standard

³Integrated Risk Information System

E-4 Inclusion/Exclusion Criteria and Tags for the Human Health Hazard Literature

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. Human Health Hazard Inclusion/Exclusion Criteria and Tags

Tag Category	Inclusion/Exclusion Criteria	Example Keywords
ON TOPIC, GENERAL HUMAN HEALTH TAGS		
Human Hazard ID	<p>INCLUDE:</p> <ul style="list-style-type: none"> Studies evaluating human health effects resulting from exposure to the chemical. Includes epidemiology studies (measure an adverse outcome in an exposed population), experimental studies (e.g. individuals exposed to chemical in a controlled study) and case studies (e.g. individual case report on accidental exposure to chemical) Acute, subchronic, and chronic exposures <p>**Also choose applicable health effect tags in next section "Carbon Tetrachloride (CCL4) Health Effect Tags"</p>	case-control study; cohort study; odds ratio; risk ratio; incidence; prevalence
Animal Hazard ID	<p>INCLUDE:</p> <ul style="list-style-type: none"> Studies evaluating animal health effects resulting from controlled exposure to the chemical in mammals such as primates, rodents, dog, rabbit, and mink. CCL4 is used to induce cirrhosis or fibrosis and study contains control group and relevant endpoints CCL4 is used as to induce fibrosis to test the hepatoprotective effects of other compounds (e.g., drugs, antioxidant or medicinal herbs) and examines the treatment given before or at the same time as the CCL₄ treatment <p>**Also choose applicable health effect tags in next section "Carbon Tetrachloride (CCL4) Health Effect Tags"</p> <p>EXCLUDE:</p> <ul style="list-style-type: none"> Studies in birds and fish; these can be tagged to MOA and/or ADME if applicable CCL4 used to induce cirrhosis or fibrosis and study does not have a control group CCL4 used to induce cirrhosis or fibrosis for the sole purpose of comparing 	chronic; developmental; incidence; NOEL/LOEL; NOAEL/LOAEL; dose; response

	<p>“normal” hepatic cells to “damaged cells”</p> <ul style="list-style-type: none"> • CCl4 is used to induce fibrosis to test the hepatoprotective effects of other compounds (e.g., drugs, antioxidants or medicinal herbs) and treatment is given after carbon tetrachloride exposure to treat fibrosis • CCl4 is used in addition to other treatments (e.g., 2-AAf, LPS, or partial hepatectomy) in order to cause a specific effect or response in the liver 	
ADME	<p>INCLUDE:</p> <ul style="list-style-type: none"> • Studies describing the absorption, distribution, metabolism and elimination (ADME) of the chemical. This may include <i>in vitro</i> studies 	<p>absorption, distribution, metabolism, elimination, bioavailability, tissue burden, metabolites, analytes, excretion, elimination rates, clearance, half-life, dose-duration, km, ki, vmax, lactational transfer, inhalation pharmacokinetics, toxicokinetics, PBPK, PBTK accumulation or retention in breast milk, serum, plasma, blood, urine, feces, adipose tissue</p>
MOA	<p>INCLUDE:</p> <ul style="list-style-type: none"> • Studies evaluating the mode of action (MOA) of a chemical (i.e., molecular events occurring after exposure that may contribute to the development of adverse health effects) in animals and humans • Evaluation of specific pathways (e.g., through the use of antioxidants to determine importance of ROS in hepatic effects) • Studies in knockout mice • Assessment of hormone levels or gland function, immune system parameters <p>**Also choose applicable MOA tags in section below under “Carbon Tetrachloride (CCL4) MOA Tags”</p>	<p><i>in vitro</i> models, genomics, proteomics, genotoxicity, indirect genotoxicity, changes in gene expression or mRNA levels</p>
Susceptibility	<p>INCLUDE:</p> <ul style="list-style-type: none"> • Studies that specifically evaluate genetic traits or variations, subpopulations or lifestages, in relation to CCL4 exposure/effects <p>EXCLUDE:</p> <ul style="list-style-type: none"> • Studies using knock-out mice 	<p>influence of genetic traits, variations, genetic polymorphisms (e.g. single nucleotide polymorphisms; SNPs) on health effects relating to the chemical</p>
ON TOPIC, CARBON TETRACHLORIDE (CCL4) HEALTH EFFECT TAGS		
Hepatic non-cancer	<p>INCLUDE:</p> <ul style="list-style-type: none"> • Studies evaluating hepatic effects in the liver, biliary tract, gall bladder 	<p>fatty degeneration, cirrhosis, fibrosis, necrosis, hypertrophy, hyperplasia, proliferation,</p>

		increased/decreased liver enzymes, bile acids, cholesterol and triglycerides in serum/blood, increased/decreased liver weight, jaundice, vacuolization
Renal non-cancer	INCLUDE: <ul style="list-style-type: none"> Studies evaluating renal effects in the kidney, bladder, ureter and related 	nephropathy, oliguria, increased/decreased blood urea nitrogen, nephritis, nephrosis, hyaline droplet formation, necrosis and regeneration of proximal tubules, markers of kidney damage e.g. excretion of proteins/blood in urine, alpha 2U globulin
Neurological non-cancer	INCLUDE: <ul style="list-style-type: none"> Studies evaluating effects in the central nervous system (CNS) or peripheral nervous system, brain, nerves, behavior, neurochemical alterations, sensory effects, neurodevelopmental effects in exposed infants and children 	changes in brain pathology, CNS depression (dizziness, drowsiness, sleepiness, loss of consciousness/ anesthesia, hypo activity, ataxia, lethargy, impaired coordination or balance, narcosis), nerve/neuronal injury and/or degeneration, neuropsychological outcomes (e.g. mood/personality changes), changes in neurobehavioral tests (cognitive, motor function) and neurophysiological effects (visual and auditory function), memory
Reproductive/Developmental non-cancer	INCLUDE: <ul style="list-style-type: none"> Studies examining reproductive outcomes, offspring and/or studies examining developmental effects Notes: <ul style="list-style-type: none"> Developmental neurotoxicity effects are categorized in the Reproductive/Developmental non-cancer tag and Neurological non-cancer tag 	reduced fertility, effects on reproductive organs, sperm, estrous cycle, increased resorption and post implantation loss, viability, fetal death, birth weight, growth, maturation, teratogenicity, birth defects, visceral and/or skeletal malformations, follicle counts
Immunological non-cancer	INCLUDE: <ul style="list-style-type: none"> Studies examining susceptibility or resistance to infection or disease, function of innate or adaptive immunity 	hypersensitization, increased/decreased white blood cells, effects on the spleen
Cardiovascular non-cancer	INCLUDE: <ul style="list-style-type: none"> Studies examining cardiovascular effects in the heart and vasculature 	stroke, hypertension, tachycardia, cardiac arrhythmias
Gastrointestinal non-cancer	INCLUDE: <ul style="list-style-type: none"> Studies examining gastrointestinal effects on the mouth, on dentition, salivary glands, esophagus, stomach, intestines, rectum 	nausea, vomiting, abdominal pain, anorexia
Irritation	INCLUDE: <ul style="list-style-type: none"> Studies examining irritation (primary or secondary) of the skin, eyes, 	erythema, itching, blisters, swelling, edema (skin); pain swelling, lacrimation, photophobia (eyes); nausea, vomiting, and abdominal

	gastrointestinal tract or respiratory tract	pain (gastrointestinal tract), rhinitis, prickling or burning sensation in the nose and throat, dry, scratchy throat (respiratory tract)
Respiratory non-cancer	INCLUDE: <ul style="list-style-type: none"> Studies examining non-cancer respiratory effects in the lungs 	chemical pneumonitis, inflammation, bronchopneumonia, alveolar epithelial proliferation, edema, lung disease, bronchitis, pulmonary function tests, FEF, FEV1, bronchitis, COPD, cough, chest discomfort, PEFR, respiratory symptoms, respiratory infection, dyspnea, wheeze, lung function, effects on the nasal cavity (nasal respiratory and olfactory epithelium), bronchial or tracheal epithelium
Carcinogenicity	INCLUDE: <ul style="list-style-type: none"> Studies that evaluate any cancer effect 	particular cancers include: breast, liver, kidney, blood, lymph, adrenal gland
Other non-cancer health effect	INCLUDE: <ul style="list-style-type: none"> Studies in which other non-cancer health effects, not defined by the categories above, were examined 	NA
ON TOPIC, CARBON TETRACHLORIDE (CCI4) MOA TAGS		
Genotoxicity	INCLUDE: <ul style="list-style-type: none"> Studies that evaluate genetic (i.e., DNA) damage Notes: <ul style="list-style-type: none"> Studies that describe a molecular event other than genotoxicity or indirect genotoxicity (e.g. changes in gene expression), are categorized in the MOA tag only 	chromosomal aberration, micronucleus assay, aneuploidy, polyploidy, cytogenicity, genotoxic, mutagenic, reverse mutation, DNA repair, unscheduled DNA synthesis, differential DNA repair, mitotic recombination, sister chromatid exchange, DNA strand breaks, DNA binding, DNA damage, DNA adducts, DNA methylation, studies in bacteria (<i>E. coli</i> , <i>Salmonella</i> e.g. Ames test, reverse mutation assay), yeast, fungi, cell lines/culture and in whole animals (e.g. fruit flies – <i>Drosophila</i> , rat, mouse)
Indirect genotoxicity	INCLUDE: <ul style="list-style-type: none"> Studies that evaluated indirect genetic (i.e., DNA) damage i.e. without direct interaction of the chemical with DNA Notes: <ul style="list-style-type: none"> An example is oxidative DNA damage where the chemical causes an increase in reactive oxygen species (ROS) that then in turn interact with and cause damage to DNA. EXCLUDE:	reactive oxidative stress, 8-hydroxy-2'-deoxyguanosine (8-OH-dG), oxidative DNA damage

	<ul style="list-style-type: none"> Studies that evaluated ROS but not DNA damage or in the context of cancer, since ROS is involved in numerous effects 	
ON TOPIC, GENERAL STUDY TAGS		
Source Type	INCLUDE: <ul style="list-style-type: none"> Database Search Gray Literature <ul style="list-style-type: none"> EPA Source Other Government Source Industry-Specific Source Peer-reviewed Literature Direct Communications Primary Source Secondary Source 	Determination of source type of database search or gray literature is by search type, rather than keyword Primary Source: Novel, experimental, modeling Secondary Source: Review
NOT ON TOPIC		
Not on topic	INCLUDE: <ul style="list-style-type: none"> Reference is not on topic in the context of any of the outlined categories (or tags) 	NA
Exposure ¹	INCLUDE: <ul style="list-style-type: none"> Reference contains exposure information only, i.e., without associated information on health effects (e.g. clinical signs or symptoms in exposed population) and will be evaluated by that team. Notes: <ul style="list-style-type: none"> Levels of the chemical in biological tissues or fluids were considered related to the human health discipline and categorized under the ADME tag 	industrial hygiene surveys, general populations exposures (e.g. measured in air, water and food)
OTHER		
Foreign language study	INCLUDE: <ul style="list-style-type: none"> Full-text reference published in non-English language. Use in addition to “on topic” or “off topic” tags. 	Title will likely be in brackets or journal title will be in foreign language only

¹An exposure tag was included to capture references potentially relevant to the exposure topic area to be reviewed by exposure experts

E-5 Inclusion/Exclusion Criteria for the Environmental Hazard Literature

The following are the inclusion criteria used for the results of the ECOTOX literature search. Studies that meet the acceptability criteria are considered on-topic (or applicable).

1. The paper reports toxicology information for the chemical of interest.
2. The article is published in the English language.
3. The study is presented as a full article.
4. The paper is a publicly available document.
5. The paper is the primary source of the data.
6. The paper reports a calculated endpoint.

7. The paper reports that treatment(s) were compared to an acceptable control.
8. The paper reports an explicit duration of exposure.
9. The paper reports a concurrent environmental chemical concentration/dose or application rate.
10. The paper reports the location of the study (e.g., laboratory vs. field).
11. The paper reports a biological effect.
12. The paper reports the species that was tested; and this species can be verified in a reliable source.
13. The paper reports effects associated with a single chemical exposure.

For more information, refer to the document "*ECOTOX Literature Searches, Citation Identification and Skimming*" ([[HYPERLINK "https://cfpub.epa.gov/ecotox/blackbox/help/ECOTOXLiteratureSearchesCitationIdentificationandSkimming.pdf"](https://cfpub.epa.gov/ecotox/blackbox/help/ECOTOXLiteratureSearchesCitationIdentificationandSkimming.pdf)]).

The following is a list of ECOTOX rejection codes, exclusion terms and definitions utilized under the ECOTOX database efforts. Each citation that is identified as off topic (or not applicable) to the ECOTOX database will have one or more of these codes.

For more information, refer to the document *ECOTOX Literature Searches, Citation, Identification and Skimming* ([[HYPERLINK "https://cfpub.epa.gov/ecotox/blackbox/help/ECOTOXLiteratureSearchesCitationIdentificationandSkimming.pdf"](https://cfpub.epa.gov/ecotox/blackbox/help/ECOTOXLiteratureSearchesCitationIdentificationandSkimming.pdf)]) under Appendix C: Unify References Data Fields and Codes.

Table_Apx [STYLEREf 6 \s]-[SEQ Table_Apx * ARABIC \s 6]. ECOTOX Codes Denoting Exclusion Criteria

[SEQ CHAPTER \h \r 1]Keyword	Description
ABSTRACT	Study results published as an abstract only.
ADDENDUM	Publication is a supplement to another publication and attach to that full publication (erratum or addendum).
BACTERIA	Bacteria and microbes - for microbes, enter bacteria as keyword, Includes microbes and Microtox tests.
BENEFICIAL EFFECT	Studies that result in a positive effects (improving the health of the organism
BIOLOGICAL TOXICANT	General biological toxicants including venoms, fungal toxins, Bacillus thuringiensis, and other plant, animal or microbial extracts or toxins not purified.
CAS # UNAVAILABLE	Chemical is not verifiable or no CAS # available.
CHEM METHODS	The description of chemical analysis procedures and measurements in a laboratory setting. No organism or biochemical measurements are reported in the paper.
ECOCHEM VERIFICATION SOURCE	Publication used to verify chemical CAS or physical/chemical properties.
EFFLUENT	Includes sewage and polluted runoff. Used in aquatic publications. Terrestrial categorized under MIXTURE keyword.
FATE	Chemical distribution in natural media (water, soil, air) and residue not measured in the organism or valid ECOTOX organism not present.
FOOD	Test organism is dead or harvested in the form of consumer-ready food products. Frequently studies include analyses of fresh meat or produce purchased in a market, or processed and packaged foods (e.g., wine, cheese, canned fish, sausages, packaged milk, or cereal products). This includes market studies used to enhance the marketability of an

	organism and maximize a producer's profit. Optimum marbling of meat, color of apple skins, and firmness of bananas for durability in shipping.
HUMAN HEALTH	Studies with human subjects or with surrogate animal subjects for human health risk assessment. If a surrogate laboratory rodent (RODE) or domestic animal (DOM,DOMA) is tested, citations will be rejected unless the effect is GRO, MOR, POP, BEH (feeding/reproductive behavior only) or REP.
INCIDENT	Reports of animal deaths by poison, which lacks a usable concentration and/or duration.
INCOMPLETE CITATION	Citation is not complete; order status ARCHIVE.
INCORRECT CITATION	Citation is wrong; order status ARCHIVE.
INHALE	Inhalation dose route only. Keyword also used for intratracheal instillation of a chemical directly into the lungs.
METHODS	Publication provides documentation for toxicology test methods, experimental design, statistical methods, standard terminology, recently developed test methods.
MIXTURE	No single chemical tests reported. The exception for In Situ studies (field studies of chemicals mixtures) are coded for bioaccumulation, if the exposure duration and concentrations of any specific chemical component of the ambient water or effluent is given for caged or transplanted organisms.
MODELING	Modeling only, no new organism exposure data; modeling studies may report original toxicity tests performed as comparisons or as a basis for extrapolation, if so, papers are ordered.
NO CONC	No usable dose or concentration reported after examination of the entire paper; includes lead shot studies lacking dose information and which report only the number of pellets. Concentrations reported in log units only are not coded.
NO DURATION	No duration reported (entire publication examined).
NO EFFECT	No organism effect reported. Chemical metabolism is included (defined as biological effect on the chemical).
NO SOURCE	Source of publication undetermined; order status ARCHIVE (includes internal chemical company document and personal communication citations).
NO TOXICANT	No chemical toxicant added or not ecotoxicologically relevant chemical. - includes ambient air component chemicals (ozone, CO ₂ , SO ₂) and pollution -other ambient conditions including changes in conditions (other than chemical addition), including radioactivity, ultraviolet light (UV), temperature, pH, salinity, dissolved oxygen (DO), or other water, air or soil parameters
NON-ENGLISH	Paper's full text language other than English - (these papers do not receive ECOREF numbers).
NUTRIENT	<i>In situ</i> chemicals tested as nutrients.
OIL	Oil and petroleum products
PUBL AS	Paper (by same author/study) was published in another journal or book, ECOREF number of other paper listed in References citation. Ex. Publ As #####
QSAR	Quantitative Structure Activity Relationships.
REFS CHECKED	References in a REVIEW have been checked.
RETRACTED	Retracted article from publication by journal.
REVIEW	All toxicity tests reported elsewhere; REVIEW bibliography may be skimmed to identify relevant citations.
SEDIMENT CONC	Chemical concentration reported in sediment only (if pore or overlying water concentrations reported, then applicable).
SKIMMED	Used to show that publication has been skimmed for applicable sections.
SPECIES VERIFICATION SOURCE	Publication used to verify species common or scientific name.
SURVEY	Measured chemical present in organism, but lacking quantification of exposure; lacks usable concentration and/or duration.
VIRUS	Virus used as a test organism.

YEAST	Yeast used as test organism.
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Mike Dourson Confirmation Hearing Preparation

QUESTIONS AND ANSWERS

OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

Confirmation Hearing Preparation: Questions/Answers
for Mike Dourson, Nominee for OCSPP Assistant Administrator

Potential Areas of Questioning

OCSPP Leadership (OCIR to develop)

- Nancy Beck (NGO blogs, press)

Alleged Conflicts of Interest (OCIR to develop)

- Past chemical industry clients (NGO blogs, press)

FY18 Budget

- Zeroing out of STAG
- Zeroing out of P2
- Significant cut to TRI
- Zeroing out of Lead Risk Reduction
- Zeroing out of Science Policy and Biotech
- Zeroing out of Endocrine Disruptors
- Zeroing out of Categorical Grants
- How hiring freeze/FTE reductions are likely to affect programs?
- How may reductions to ORD affect OCSPP Programs?

Office of Pesticide Programs (OPP)

- Certification of Pesticides Applicators Rule
- Worker Protection Standard
- Chlorpyrifos
- Dicamba
- Glyphosate
- Organophosphates
- Endangered Species Act
- PRIA4
- Neonicotinoids
- Atrazine

Office of Pollution Prevention and Toxics (OPPT)

- TSCA Implementation Activities
- TSCA Framework Rules
 - o Active/Inactive Inventory Rule
 - o Prioritization Rule
 - o Risk Evaluation Rule
- First 10 Chemical Risk Evaluations
- New Chemicals Reviews
- TSCA CBI
- Safer Choice Program
- Formaldehyde
- Lead

- Polychlorinated Biphenyls (PCBs)
- Per- and Polyfluoroalkyl Substances (PFOA/PFAS)
- TSCA Section 6 Rules - TCE and Methylene Chloride/NMP
- Views on the role of enforcement in effective implementation
- Views on how Exec Orders on burden/regulation reduction will affect implementation
- Does EPA have enough information to evaluate the risk of most chemicals?

Office of Science Coordination and Policy (OSCP)

- OSCP Science Coordination Overview
- Science Advisory Committee on Chemicals (SACC)
- Endocrine Disruptor Screening Program (EDSP)
- FIFRA Science Advisory Panel (SAP)

FY18 BUDGET

P2 Program Elimination

Q. Why did EPA choose to eliminate funding for the Pollution Prevention (P2) Program? What are the impacts of this elimination?

Answer:

- The FY 2018 President's budget eliminates programs that are mature, duplicative, or can be absorbed into other programs, are equally conducted or eligible under other programs, or are or could be state and local responsibilities
- The FY 2018 President's Budget is the Administration's request to Congress for appropriations; EPA's funding levels for FY 2018 will be determined by Congress through the annual congressional appropriations process.

Background:

- OCSPP's P2 activities include the Safer Choice labeling program, development of Environmentally Preferable Purchasing (EPP) standards, supporting Green Chemistry/Engineering, and provision of P2 related grants, information and support to States.
- EPA has made great strides in carrying out the intent of Congress to encourage reductions in the generation, use and release of hazardous substances while helping businesses reduce operational costs
- Based on previous investments in P2 solutions made under the P2 Program in previous year, EPA expects partners will be able to continue to share best practices and seek additional pollution prevention solutions.
- Within EPA, programs implementing environmental laws will continue to pursue approaches that prevent pollution at the source. For example, pollution prevention has, and is expected to be, a key tool in implementing the Toxics Substances Control Act, as amended in 2016, which requires EPA, in promulgating rules to mitigate unreasonable risk, to consider technically and economically feasible alternatives that benefit health or the environment (TSCA Section 6(c)(2)C).

Toxics Risk Inventory (TRI) Reduction

Q. What is the expected impact of the reduction to the Toxics Risk Inventory Program?

Answer:

- The proposed funding reduction will eliminate funding for the TRI National Training Conference, TRI University Challenge, TRI Information Center, TRI Tools, and other TRI communication initiatives.
- The FY 2018 President's Budget is the Administration's request to Congress for appropriations; EPA's funding levels for FY 2018 will be determined by Congress through the annual congressional appropriations process.

Background:

- EPA will continue to meet its requirements regarding the collection of chemical release data and making said data available to governments and the public. Additionally, as required by the Emergency Planning and Community Right-to-Know Act (EPCRA), the agency will respond to EPCRA petitions regarding TRI within 180 days after receipt.
- The Toxics Release Inventory (TRI) program supports the EPA's mission by annually publishing, for the public, release and other waste management (e.g., recycling) and pollution prevention data on over 650 toxic chemicals from approximately 20,000 industrial and federal facilities. The TRI Program is a premiere source of toxic chemical release data for communities, non-governmental organizations, industrial facilities, academia, and government agencies.

Lead Risk Reduction Program Elimination

Q. Why did EPA choose to eliminate funding for the Lead Risk Reduction Program? What are the impacts of this elimination?

Answer:

- The FY 2018 President's budget eliminates programs that are mature, duplicative, or can be absorbed into other programs, are equally conducted or eligible under other programs, or are or could be state and local responsibilities.
- The FY 2018 President's Budget is the Administration's request to Congress for appropriations; EPA's funding levels for FY 2018 will be determined by Congress through the annual congressional appropriations process.

Background:

- The Lead Risk Reduction Program is a mature program that in its entirety will not be eliminated, certain critical aspects of the program will continue. At a minimum, EPA will continue to provide firm and individual certifications for safe work practices for lead-based paint abatement and renovation and repair efforts. EPA also will continue to provide for operation and maintenance of the online database (FLPP) that supports the processing of applications for training providers, firms, and individuals. These aspects of the lead program will be funded at \$500K and 2 FTE through the Chemical Risk Review and Reduction program.
- The United States has made tremendous progress in reducing lead exposure, resulting in lower childhood blood lead levels over time. Childhood blood lead levels have declined substantially since the 1970s; 1.2% of children had BLL ≥ 5 $\mu\text{g/dL}$ in 2011–2014, compared with 26% in 1988–1994 and 8.7% in 1999–2002. The progress that has been made has resulted, in part, from the implementation and enforcement of multiple U.S. regulations, including those under EPA's Lead Risk Reduction Program established in 1992, which aim to reduce childhood lead exposures or ameliorate its effects.

Science Policy and Biotechnology Program Elimination

Q. What is the expected impact of the elimination of the Science Policy and Biotechnology Program?

Answer:

- The FY 2018 President's budget eliminates programs that are mature, duplicative, or can be absorbed into other programs, are equally conducted or eligible under other programs, or are or could be state and local responsibilities.
- The FY 2018 President's Budget is the Administration's request to Congress for appropriations; EPA's funding levels for FY 2018 will be determined by Congress through the annual congressional appropriations process.

Background:

- The science advisory committee oversight required by FIFRA and TSCA will be supported by the pesticides and toxics program offices utilizing their programmatic resources.

Endocrine Disruptor Screening Program Elimination

Q. What is the expected impact of the elimination of the Endocrine Disruptor Screening Program?

Answer:

- The FY 2018 President's budget eliminates programs that are mature, duplicative, or can be absorbed into other programs, are equally conducted or eligible under other programs, or are or could be state and local responsibilities.
- The FY 2018 President's Budget is the Administration's request to Congress for appropriations; EPA's funding levels for FY 2018 will be determined by Congress through the annual congressional appropriations process.

Background:

- The Endocrine Disruptor Screening Program (EDSP) is a mature program that was established in 1996 under authorities contained in the Federal Food, Drug and Cosmetic Act (FFDCA) and the Safe Drinking Water Act (SDWA) amendments. The ongoing functions of the program can be absorbed into the pesticides program office.
- Current activities within the EDSP include transitioning to the use of high throughput screening (HTS) and computational toxicology (CompTox) tools to screen thousands of chemicals for endocrine activity, establishing policies and procedures for screening and

testing, and evaluating data to ensure chemical safety by protecting public health and the environment from endocrine disrupting chemicals.

Categorical Grant Elimination / Reduction in Funding

Q. Why did EPA choose to eliminate funding for the Lead and Pollution Prevention Categorical Grants to States and Tribes and reduce funding for the Pesticides Implementation Grants? What are the impacts of these eliminations and reductions?

Answer:

- In the FY 2018 President's Budget, EPA is prioritizing resources to support the agency's mission, the budget supports a renewed focus on achieving its statutory responsibilities to protect the nation's air and water quality. The Agency will work with its state and local partners to identify shared priorities and make progress in achieving them.
- The FY 2018 President's Budget is the Administration's request to Congress for appropriations; EPA's funding levels for FY 2018 will be determined by Congress through the annual congressional appropriations process.

Background:

- Lead - Although EPA's grant funding for Lead-based paint to states is proposed for elimination, states could choose to fund programs targeted at reducing lead based paint poisoning and continue activities that have been supported by EPA. Additionally, other forms of lead exposure (in water and air) continue to be addressed through a host of federal and state programs.
- P2 – Existing P2 partners & grant recipients are expected to be able to continue to share best practices and build on successes already achieved using P2 Categorical Grant resources.
- Pesticides - Due to the funding reduction renewed focus will be placed on streamlining core activities and reducing duplication. The EPA will work with states and Tribes to target funds to core requirements while providing flexibility to address particular priorities.
- FY 2017 Enacted Funding Levels – P2: \$4,765.0K; Lead: \$14,049.0K; Pesticides: \$12,701.0K
- FY 2018 President's Budget Funding Levels – P2: \$0.0K; Lead: \$0.0K; Pesticides: \$8,874.0K

Hiring Freeze / FTE Reductions

Q. How will the continued EPA hiring freeze and proposed FTE reductions in the FY 2018 President's Budget impact OCSPP?

Answer:

EPA will streamline existing business processes and eliminate unnecessary redundancies to utilize staff in line with the FY 2018 budget and with the agency's top human health priorities.

Background:

The FY 2018 President's Budget reduces OCSPP's overall FTE by 159.6, from 1,156.0 in FY 2017 to 996.4 in FY 2018.

Impacts of ORD Reductions on OCSPP

Q. How will the proposed reductions in the FY 2018 President's Budget impact OCSPP's ability to complete its mission?

Answer:

In FY 2018, the EPA will prioritize science and research activities directly tied to statutory requirements and inquiries into environmental and human health sciences. Science and research will be streamlined to support the agency's program and will prioritize the most important work to protect human health and the environment.

Background:

ORD's "Chemical Safety and Sustainability" Research Program is funded at \$61.7M in the FY 2018 President's Budget, a \$27.5M reduction compared against the FY 2017 President's Budget. This research program includes funding for Endocrine Disruptors and Computational Toxicology research.

OFFICE OF PESTICIDE PROGRAMS

Certification of Pesticide Applicators Rule

Q. Why did EPA extend the effective date of the certification rule?

Answer:

The effective date has been delayed to allow time for a substantive review of the questions of fact, law and policy associated with the rule, in accordance with the Presidential directives provided in the memorandum of January 20, 2017.

The extension also allows time for EPA to consider revisions to the certification rule based on input received through the Regulatory Reform Agenda efforts. If EPA's Regulatory Reform Agenda efforts identify a need for additional changes to the certification rule, EPA will pursue such changes through notice and comment rulemaking.

Background:

The effective rule date was delayed from March 6, 2017 to May 22, 2018, The Presidential directives provided in the memorandum of January 20, 2017 was from Reince Priebus, Assistant to the President and Chief of Staff, titled "Regulatory Freeze Pending Review," and the principles identified in the April 25, 2017, Executive Order "Promoting Agriculture and Rural Prosperity in America."

EPA's Certification of Pesticide Applicators rule (certification rule), 40 CFR Part 171, sets federal standards for states, tribes and federal agencies to administer programs to certify applicators of restricted use pesticides (RUPs). The certification rule establishes minimum standards of competency for pesticide applicators that apply or supervise the use of RUPs, covering private and commercial applicators, and those using RUPs under their direct supervision. The certification programs are conducted by pesticide lead agencies in states, territories, tribes and federal agencies. The certification rule has been in place since 1974; a revised rule was issued in the Federal Register on January 4, 2017.

On August 24, 2015, EPA published a Federal Register Notice soliciting public comments on a revision to the 1974 Certification of Pesticide Applicators of restricted use pesticides rule. After extensive stakeholder review of the original regulation and an analysis of over 700 distinct comments, EPA published a final rule on January 4, 2017 with an effective date of March 6, 2017. EPA extended the effective date to March 21, 2017 by rule on January 26, 2017, and subsequently extended it again to May 22, 2017 by rule issued March 20, 2017. In accordance with the January 20, 2017 Presidential directives "Regulatory Freeze Pending Review," and the principles identified in the April 25, 2017 Executive Order "Promoting Agriculture and Rural Prosperity in America," on May 5, 2017 EPA gave a four-day public comment period on a proposed delay of the effective date from May 22, 2017 to May 22, 2018. On May 22, 2017, EPA announced an interim effective date of June 2, 2017 to consider and respond to public comments received in regard to the proposed May 22, 2018 extension. On June 2, 2017, EPA announced the effective date of May 22, 2018.

Q. What is the status of the lawsuit regarding the process EPA used to delay the effective date? Will the effective date change again?

Answer:

The extension of the certification rule's effective date is under legal challenge, so EPA cannot comment on the delayed date at this time.

Background:

In June 2017, a group* of nonprofit farmworker organizations submitted a challenge in the 9th District Court to EPA's delay of the Certification of Pesticide Applicators Rule. The group asserted that EPA violated the Administrative Procedure Act (APA) and the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA) by issuing "repeated, unlawful" delays of the Rule. EPA published two Federal Register Notices delaying the effective date of the Rule without soliciting public comment. In a third Federal Register Notice, EPA gave the public four days to submit comments on a one-year delay, whereas the group asserts that the APA requires a minimum 30-day comment period. Also, the group asserts EPA failed to provide adequate justification for a one-year delay in contrast to EPA's justification that the final Rule was necessary to comply with FIFRA obligations to prevent unreasonable adverse effects to applicators, workers, the public, or the environment. With this challenge, the group is asking the court to vacate the delays which would make the rule effective immediately. (*Pineros Y Campesinos Unidos del Noroeste, United Farm Workers, Farmworker Association of Florida, California Rural Legal Assistance Foundation, and Pesticide Action Network North America)

Q. What is the impact to human health and the environment if implementation is delayed?

Answer:

The existing certification programs remain in effect. The issues identified during the development of the revised rule will be addressed when the revised requirements are implemented. Once the rule is effective, certifying authorities will have three years to revise and submit their certification plans to EPA for review.

Background: The revised Certification of Pesticide Applicators of restricted use pesticides (RUPs) rule seeks to enhance and improve the competency of certified RUP applicators and persons working under their direct supervision. The rule aims to protect applicators from exposure while working with RUPs, and the public and the environment from exposure to RUPs as a result of misapplication by applicators. In the FIFRA-required cost-benefit analysis, EPA found that the revised requirements of the 2017 revised regulation would help prevent illness and injury to applicators, the public and the environment.

Q. Some states will require legislative and/or regulatory changes to implement the revisions. How is EPA addressing this burden?

Answer:

The current final rule provides options and flexibility for implementing the requirements. EPA will continue to work with and engage in open and transparent discussions and negotiations with the states and certifying authorities as they develop revised plans.

Background:

EPA extended the effective rule date which allows additional time for EPA to consider revisions to the current rule based on input received through the Regulatory Reform Agenda efforts.

If states want to certify pesticide applicators, FIFRA requires that all state pesticide applicator authorities (usually state departments of agriculture) have an EPA-approved Certification Plan. The contents of the Certification Plan are outlined in the Certification of Pesticide Applicators of restricted use pesticides rule. Some states will have to make legislative and regulatory changes to their certification program. EPA-approval of the Certification Plan is contingent upon such changes.

In response to commenters' concerns expressed during the public comment period for the proposed rule, EPA adopted a final rule with options for more flexible time frames to implement the requirements. The final rule lengthens the time for certifying authorities to submit revised certification plans and allows EPA discretion to grant certifying authorities more or less than two years to implement newly approved plans. Certifying authorities will have three years to revise and submit their certification plans. The final rule adds a provision to grant conditional approval of certification plans. Certifying authorities unable to complete necessary legislative and regulatory changes before submitting their new certification plan would be allowed to submit a draft plan conditioned upon those changes becoming effective.

Q. How can EPA justify the rule's additional burden? What will this cost?

Answer:

The rule will improve the pesticide applicator certification and training program substantially and EPA decided that the benefits justify the costs. Pesticide safety education helps applicators improve their abilities to avoid pesticide misuse, spills and harm to non-target organisms. Trained and competent applicators are more likely to apply pesticide products without causing unreasonable adverse effects and use restricted-use pesticides properly than applicators who are not adequately trained or properly certified.

The estimated cost of the revisions is about \$31.3 million annually. The estimated annual benefits of the changes are between \$13.2 and \$26.3 million.

Background:

In addition to core pesticide safety and practical use concepts, certification and training assures that applicators possess critical information on a wide range of environmental issues, such as endangered species, water quality, worker protection, and protecting non-target organisms. In the 2015 Federal Register Notice for public comment on the 1974 Certification of Pesticide Applicators, EPA estimated costs to the affected industries would increase by approximately \$46.9 million annually because of the proposed revisions. In the 2017 final regulation, the estimated increase in burden to affected industries was reduced to approximately \$24.8 million annually. The reduction in costs is attributed to the changes EPA made in the final regulation to accommodate the needs of the affected industries.

EPA estimated the annual benefits of the changes between \$13.2 and \$26.3 million.

- This estimate only includes avoiding reported acute pesticide incidents to people – it does not quantify the potential benefits to avoiding chronic illnesses that may be related to use of restricted-use pesticides (RUPs) or the willingness to pay to avoid acute effects of pesticide exposure beyond cost of treatment and loss of productivity, nor does it quantify the potential benefits to the environment from avoiding misapplication of RUPs.
- This estimate does not account for underreporting of pesticide incidents, which when factored in could increase the potential benefits of the rulemaking to between \$65.9 and \$131.6 million annually.

EPA estimated the cost of the revisions to the rule to be about \$31.3 million annually.

- These costs are the incremental costs of complying with the new requirements in the revised rule, not the total costs of administering certification programs.
- These costs would fall mostly on certified applicators and those working under their direct supervision, but there would also be some costs for States, Tribes, and Federal agencies that administer certification programs.
- This estimate includes the cost of requiring applicators to be certified in new categories, of requiring training on safe pesticide application and protecting those working under the direct supervision of certified applicators, of implementing a mandatory timeframe for recertification of pesticide applicators, and of establishing a minimum age of 18 for persons to be able to use RUPs (with a limited exception).

Q. What resources and funding will be provided to support implementation?

Answer:

EPA will continue to give priority to funding the states and tribes for these programs through the state and Tribal Assistance Grants program; and provide funding to pesticide safety education programs from service fees collected under the Pesticide Registration Improvement Act and subsequent reauthorizations.

Background:

EPA recognizes that certifying authorities and pesticide safety education programs will need to devote resources to additional training, manual development, exam development and review, exam administration, and other services that support certification and education of pesticide applicators in conformance with the final rule.

Under the existing law, EPA must commit at least \$500,000 of the funds collected by pesticide registration-related actions to support the pesticide safety education program to assist in the operation of their certification programs.

The amount of funds is contingent upon EPA's budget and has remained stagnant over the years. EPA attempts to accommodate State's needs by providing resources such as applicator training materials and exams developed through cooperative agreements with nonprofit entities.

Q. When will guidance be available to states, tribes and federal agencies to revise their certification plans?

Answer:

EPA anticipates further dialogue with certifying authorities, as needed, to provide interpretations of and guidance on regulatory language and provisions. Guidance will be developed soon after the effective date to allow for sufficient time between the effective date and due date for certifying authorities to submit their revised certification plans to EPA for review and approval, although no date has been determined.

Background:

FIFRA requires states, tribes, territories and federal agencies (“certifying authorities”) to have EPA-approved Certification Plans before they can certify applicators of restricted use pesticides. EPA will develop guidance to help certifying authorities identify and implement the necessary changes to their Certification Plan in compliance with the revised regulations. Much of the work on developing guidance will be done by staff in the Office of Pesticide Programs, but with input and coordination with the Regions (who will ultimately be approving the plans), Office of General Counsel and Office of Enforcement and Compliance Assurance. The guidance will be developed as possible based on available staff and competing priorities.

Q. Why did EPA require a minimum age of 18 in the certification rule? Do you plan to revise this?

Answer:

A minimum age requirement was added as a reasonable precaution to protect adolescents from pesticide exposures because of the potential impact of pesticides on further development and because adolescents may not properly appreciate (and take appropriate steps to avoid) the risks of potential pesticide exposure.

EPA has received comments requesting revisions to the minimum age requirements which are currently being considered by the Agency within the Regulatory Reform Agenda efforts.

Background:

Although EPA is not able to measure the full benefits that accrue from reducing chronic exposure to pesticides, well-documented associations between pesticide exposure and certain cancer and non-cancer chronic health effects exist in peer reviewed literature. While statistical associations have been observed in studies that estimate the relation between pesticide exposure and chronic health outcomes such as cancer, the causal nature of these associations has not yet been determined; thus quantifying the magnitude of the chronic health risk reduction expected as a result of pesticide exposure reduction is not possible. Based on what is known about the potential for biologically active chemicals generally to disrupt developmental processes, it is reasonable to have heightened concern for adolescents under the age of 18 in situations where they face particularly high pesticide exposures and exposure to pesticides classified as RUPs. Although EPA agrees that certification exams are a gauge of competency, they are not the only relevant gauge, and EPA decided age should be a consideration for determining competency. Generally prohibiting adolescents under the age of 18 from applying RUPs will protect them from any potential risks of using RUPs, ensuring that adolescents do not cause or suffer

unreasonable adverse effects from using RUPs. Based on the comments received on the proposed rule and an evaluation of existing literature related to adolescents' development of maturity and judgment, EPA decided that the benefits of generally prohibiting persons under 18 years old from applying RUPs justify the costs.

The 1974 Certification of Pesticide Applicators regulation has no minimum age restriction for certified applicators of restricted use pesticides (RUPs), or to persons using RUPs under their supervision. Pesticides not classified as RUPs are available for use by the general public. In contrast, EPA classifies a pesticide as RUPs if the toxicity exceeds one or more human health toxicity criteria; it is hazardous to non-target organisms or ecosystems; or if it may cause unreasonable adverse effects on human health and/or the environment without such restriction. EPA proposed a minimum age requirement for RUP use of 18 for private and commercial applicators, as well as for persons working under their direct supervision. The Department of Labor requires that workers in non-agricultural industries be at least 18 years old to perform hazardous jobs and 16 for nonagricultural employment when working with pesticides unless employed by a parent or someone standing in place of the parent. Also, the Fair Labor Standards Act establishes a minimum age of 16 for agricultural occupations deemed hazardous by the Secretary of Labor. The final rule requires a minimum age of 18 to use a RUP, with certain exceptions for persons 16 years of age working under the supervision of a private applicator who is a member of the immediate family. EPA provided this exception to alleviate the impacts to family farms.

Q. There is an exception to the minimum age of 18 for noncertified applicators using RUPs under the direct supervision of a private applicator who is also an immediate family member. Why doesn't the exception extend to pest operator small businesses?

Answer:

- In the revised rule, all applicators seeking certification, whether as a private applicator (farmer) or commercial applicator (for hire), must be at least 18 years old. There is no exception to the minimum age of 18 for certified applicators.
- Applicators using restricted use pesticides under the direct supervision of a certified applicator must also be at least 18 years old, with one exception.
 - A person working under the supervision of a private applicator who is also an immediate family member, and working on a family farm can be as young as 16 and apply restricted use pesticides. This approach is partly based on the Worker Protection Standard's partial exemption for owners of agricultural establishments and their immediate family members.
- EPA did not add an exception to the minimum age for people using restricted use pesticides under the supervision of a commercial applicator, regardless of whether the supervising commercial applicator is a member of the noncertified applicator's immediate family.
- These types of restricted use pesticide applications are more likely to occur at sites where misapplication could cause harm to other people, such as to schools, homes, hospitals, parks, shopping centers and offices.

Background:

To ensure an adequate level of protection not only for the person being supervised, but also for those who live in, work at, or visit areas treated by these noncertified applicators, EPA has chosen to require that all noncertified applicators under the supervision of commercial applicators must be at least 18 years old.

EPA provided an exception to the 18-year old minimum age requirement so that persons in agriculture working under the supervision of a certified private applicator who is a member of their immediate family, under certain conditions. EPA provided this exception to alleviate the burden to “family farms.” Under the Worker Protection Standard (WPS), the 2015 revisions established a minimum age for pesticide handlers (mixers, loaders and applicators) and for early-entry workers (who do work in treated areas during the restricted-entry interval under certain conditions and constraints). However, the WPS exempts owners of agricultural establishments (farms, forest, nurseries and greenhouses) and their immediate family members from many of the WPS requirements, including the minimum age requirements. The exception in the certification rule for noncertified applicators working under the direct supervision of a certified private applicator who is an immediate family member is within the scope of the WPS partial exemption.

Q. What are the impacts on small businesses?

Answer:

The rule may affect over 800,000 small entities, particularly in the agricultural sector, with an impact of less than 1% of the annual value of sales or revenues, and is expected to have a negligible effect on jobs and employment. EPA has certified that the final rule will not have a significant impact on a substantial number of small entities.

Background:

EPA convened a Small Business Advocacy Review Panel on the potential revisions to the rule in 2008. As part of the review, EPA considered input from a group of Small Entity Representatives from small businesses and organizations that could be affected by the potential revisions. In the final rule, EPA estimates that it may affect over 800,000 small farms that use pesticides. However, EPA expects that about 400,000 of those farms actually use RUPs. The impact is less than 1% of the annual revenue for the average small entity.

Q. Would this revised certification rule have prevented the 2015 pesticide misuse incident involving methyl bromide in the Virgin Islands?

Answer:

Several of the changes would make tragic incidents like the Virgin Islands incident far less likely to occur. Fumigants like the one used in that case could only be applied by trained and certified applicators, and certified applicators have to be specially trained or pass an exam to be renewed every 5 years. Those working under the supervision of certified applicators will receive training annually on using Restricted Use Pesticides safely.

Background:

In March 2015, a family fell gravely ill while on vacation in St. John, U.S. Virgin Islands after having been exposed to methyl bromide, a highly toxic RUP. Members of the family suffered permanent damage. In violation of the label and the law, two Terminix employees applied the outdoor, agricultural use pesticide to eradicate bugs indoors in a resort condo unit below the family's. Methyl bromide can result in serious health effects, including central nervous system and respiratory system damage. EPA banned indoor use of methyl bromide products in 1984. The previous rule required users of restricted use pesticides to be certified, but lacked specific controls for applicators using certain methods of application (such as fumigation) and any mandatory recertification and did not have training requirements for those applicators working under the direct supervision of a certified applicator.

Worker Protection Standard

Q. What is the Designated Representative requirement in the revised WPS? What are the issues with it?

Answer:

Under the WPS, a worker or handler would be allowed to designate a representative who can act on behalf of the worker to request and obtain a copy of the pesticide application and hazard information required by the rule. The provision would provide workers and handlers access to appropriate pesticide-specific hazard information.

The regulated community is concerned that the requirement poses additional burdens to provide the records and, in particular, fears that the information could be misused by anti-pesticide organizations. Some commenters stated that the requirement is a violation of farmer's legal and privacy rights.

Background:

EPA established this requirement due to concerns that workers or handlers might not be able to communicate their needs in English; or understand the information without help, or they might be afraid of retaliation if they ask for it themselves. Others may have left the area because they changed jobs and don't have transportation.

Q. What is the Application Exclusion Zone (AEZ) in the revised WPS?

Answer:

The "Application Exclusion Zone" or AEZ refers to the area surrounding the pesticide application equipment that must be free of all persons other than appropriately trained and equipped handlers during pesticide applications.

Q. What are the concerns related to this requirement?

States, the regulated community, and pesticide manufacturers expressed their oppositions to the AEZ for logistical and economic reasons, stating that the approach is complicated because it

establishes another area to be controlled that varies by application type, and because it includes persons within the zone but not on or employed by the establishment.

States were concerned about their ability to enforce the requirement, and agricultural employers believed that the AEZ on farms and forests would be logistically difficult and could shut down parts of their operations while applications take place.

Background:

The AEZ is measured from the application equipment and the zone moves with the application equipment like a halo around the application equipment. The size varies depending on the type of application and other factors, including droplet size and height of nozzles above the planting medium. The distance from the application equipment may be zero, 25, or 100 feet. The requirement is intended to protect workers and other persons from pesticide contact or drift during application.

In the 1992 WPS regulation, agricultural employers could not allow or direct any person, other than an appropriately trained and equipped handler, to enter or remain in a “entry-restricted area” during an application in a nursery or greenhouse. There was no comparable requirement for farms and forests. In the March 2014 proposed rule, EPA solicited comments on retaining and slightly modifying the entry-restricted area for nurseries or greenhouses, and requiring them during applications on farms and in forests.

Commenters strongly opposed the entry-restricted area on farms and in forests, arguing that it would be difficult to comply with and was unnecessary. In the November 2015 final regulation, EPA took a different approach and required application exclusion zones to keep workers and other persons a certain distance away from operating pesticide application equipment – where pesticide is most likely to be – rather than from the edges of the areas being treated. Both the old and revised WPS include a requirement that the applicator must apply the pesticide in a way that does not contact workers or other persons, either directly or through drift. EPA felt it was necessary to include additional protections, because of the number of drift incidents despite the “do not contact” requirement.

Chlorpyrifos

Q. EPA’s previous risk assessments and several consultations with EPA’s FIFRA Scientific Advisory Panel (SAP) makes clear the potential for adverse neurodevelopmental outcomes to children as a result of exposure to chlorpyrifos. In October 2015, EPA proposed to revoke all tolerances because it could not determine that aggregate exposure to residues of chlorpyrifos were safe to children or the general population under the requirements of the FQPA. Do you support this decision, and if so, what basis does EPA have to allow the continued use of chlorpyrifos?

Response:

Following a review of public comments on both the November 2015 proposal to revoke tolerances and the November 2016 notice of data availability, EPA concluded that, despite several years of study, the science addressing neurodevelopment effects remains unresolved.

Further evaluation of the science during the remaining time provided by the statute for completion of registration review is warranted to achieve greater certainty as to whether the potential exists for adverse neurodevelopmental effects from human exposures to chlorpyrifos.

Background:

The FIFRA SAP has reviewed experimental toxicology and epidemiology data, and their incorporation into risk assessment (2008, 2012, 2016), risk assessment approaches for semi-volatile pesticides (2009) and the evaluation of a chlorpyrifos-specific pharmacokinetic-pharmacodynamic (PBPK-PD) model (2011). The SAP's reports have offered numerous recommendations for additional study and sometimes conflicting advice for how the EPA should consider (or not consider) the epidemiology data regarding potential neurodevelopmental effects in conducting the EPA's registration review human health risk assessment for chlorpyrifos.

All tolerances and uses remain available at this time, and will remain available unless EPA determines differently during the course of its ongoing review. EPA has committed to completing this review by 2022.

Q. Section 408 (b)(2)(C) of FFDCA states that “the Administrator may use a different margin of safety for the pesticide chemical residue only if, on the basis of reliable data, such margin will be safe for infants and children.” EPA and multiple SAPs have demonstrated the use of animal toxicity data alone is not reliable in making a safety finding, so why isn't EPA at least moving forward with a decision utilizing the 10X Food Quality Protection Act (FQPA) safety factor in order to protect the most sensitive populations?

Response:

In light of the SAP's conflicting advice on how the EPA should consider (or not consider) the epidemiology data regarding potential neurodevelopmental effects over the course of multiple panels, and following a review of public comments on both the November 2015 proposal to revoke tolerances and the November 2016 notice of data availability, the EPA concluded that, despite several years of study, the science addressing neurodevelopment effects remains unresolved.

When EPA completes its evaluation of the science around potential neurodevelopmental effects it will also address the need to retain the FQPA safety factor.

Background:

The November 2015 proposed rule for revoking all tolerances of chlorpyrifos was based on the 2014 human health risk assessment that used the 10% red blood cell acetylcholinesterase inhibition endpoint. At that time, EPA could not make a determination of 'reasonable certainty of no harm' due to risks identified from drinking water using a national-scale assessment. That

assessment included a 10X FQPA safety factor from uncertainty regarding the relationship of observed neurodevelopmental outcomes to acetylcholinesterase inhibition.

Q. In December 2014, EPA found unsafe drinking water contamination from chlorpyrifos as part of its risk assessment. In November 2016, EPA issued a refined drinking water assessment that still indicates potential risk to certain vulnerable watersheds. Does EPA's further reevaluation of the science around potential neurodevelopmental effects significantly impact these findings, and what would you do to address the populations where EPA has identified drinking water concerns in the meantime?

Response:

In order to determine if there is a risk of concern for drinking water exposures, EPA must first complete its evaluation of the science around potential neurodevelopmental effects and determine an appropriate Drinking Water Level of Concern in order to determine safe levels in drinking water.

Background:

EPA completed its refined regional drinking water assessment in 2016, in order to examine estimated drinking water concentrations on a regional and/or watershed scale to pinpoint community drinking water systems where exposure to chlorpyrifos as a result of chlorpyrifos application may pose an exposure concern.

Q. Given that the EPA has publicly said it moved chlorpyrifos earlier in its review schedule, to 2009, in order to address the complex and cutting edge scientific issues surrounding the potential for neurodevelopmental effects to children, do you support EPA's decision not to complete the review of chlorpyrifos until 2022?

Response:

EPA is committed to completing that review in accordance with the congressionally mandated registration review of chlorpyrifos.

Background:

EPA did move chlorpyrifos earlier in its review schedule with the intention of addressing the complex and cutting edge scientific issues surrounding the potential of neurodevelopmental effects. However, as was made apparent by the conflicting advice across SAPs for how the EPA should consider (or not consider) the epidemiology data regarding potential neurodevelopmental effects, the science addressing neurodevelopment effects remains unresolved. EPA is currently considering options for reevaluating the science around this issue, including the related epidemiology studies.

Q. EPA has previously stated it does not have access to the raw data from the epidemiology study used in its 2014 human health risk assessment, as well as the 2016 revised human health risk assessments supporting the proposed tolerance revocation. Moving forward with EPA's further evaluation of the science around potential neurodevelopmental effects, do you support EPA's reliance on a study without having access to the raw data, or the ability to make it available to the public?

Response:

While lack of access to raw data does not preclude the agency from using the results of scientific studies in its decision-making, the information and analyses available to the agency must be sufficient to ensure that conclusions drawn from the study data are fully supportable for regulatory decision-making, considering the impacts these decisions may have on public health and on the regulated community.

Background:

While the EPA strives to ensure that the data underlying research it relies upon are accessible to the extent possible, it does not believe that it is appropriate to refuse to consider published studies in the absence of underlying data. EPA frequently relies on peer reviewed studies in the public literature across agency programs without possessing underlying data and the federal courts have made clear that the EPA is not required to obtain or analyze the raw data in order to rely on such studies. If EPA and other governmental agencies could not rely on published studies without conducting independent analyses of the raw data underlying them, then much relevant scientific information would become unavailable for use in setting standards to protect public health and the environment.

Q. Numerous stakeholders and the SAP have weighed in on possible confounding factors that could affect, influence, or produce the results observed in the epidemiology study EPA has relied on for its 2014 and 2016 human health risk assessments. How would you resolve the numerous questions around the reliability of this dataset moving forward in EPA's review?

Response:

I would be interested in exploring additional analyses that would lead to a broader consensus on whether and how to utilize this information moving forward.

Background:

OPP has faced criticism from various points of view on its approach to evaluating and using epidemiology data, particularly in using the Columbia Children's Center for Environmental Health study for incorporation into the chlorpyrifos risk assessment. EPA has committed to continuing to evaluate the science around potential neurodevelopmental effects.

Dicamba

Q. What action is EPA considering to address reports of crop damage from the use of Dicamba herbicide products?

Answer:

We continue to work with stakeholders and hope to soon have an agreement from the registrants to address the risks to allow farmers to make informed choices for seed purchase for the 2018 growing season

Background:

- EPA has lead efforts to assess and understand reported crop damage by meeting with registrants, state officials and crop protection experts to discuss possible causes of the damage and determine if additional regulatory steps or use adjustments are needed to protect crops.
- While the underlying causes of the various damage incidents are not yet clear, EPA is reviewing the current use restrictions on labels for these dicamba formulations and will rely on the best information available to inform our assessment.
- Dicamba is an active ingredient contained in certain herbicides. Herbicides containing dicamba are registered for uses in agriculture, residential areas and other sites.
- Older product registrations include uses on cotton and soybeans, but are restricted to pre-plant and post-harvest burndown applications only. The product labels for those herbicides specify that restriction. Only the new registered products may be applied over-the-top of growing soybeans and cotton.
- Late last year, EPA approved the conditional registration of three new dicamba herbicide products for use in-crop (over-top of growing crop plants) as a post-emergent application in Bollgard II XtendFlex cotton and Roundup Ready 2 Xtend soybeans, which are now available for use in the 2017 growing season:
 - DuPont FeXapan Herbicide Plus VaporGrip Technology
 - Engenia Herbicide
 - XTENDIMAX with VaporGrip Technology
- EPA limited the registration to 2 years to allow for opportunity to reassess with experience.
- Despite the conditional approval of these new dicamba products with drift reduction agents and further use restrictions set in place prior to the 2017 growing season, some states are reporting high numbers of dicamba complaints. By late August, EPA had been made aware of reports of thousands of complaints made to state agencies. Initial reports came from Arkansas, Missouri, Mississippi, and Tennessee, and then expanded to northern states (Iowa, Nebraska, and Kansas) as the growing/use season proceeded.
- Both physical drift and volatilization of dicamba from the target application site have been reported.
- The underlying causes of the various damage reports are still being investigated.

Glyphosate

Q. What is the reason for the repeated delays of EPA's glyphosate risk assessment?

Answer:

EPA delayed its risk assessment to 2015 in order to respond to a petition from the Natural Resource Defense Council (NRDC); however, in the meantime, the International Agency for Research on Cancer (IARC) released its conclusion that glyphosate was a probable cancer agent in 2015. As a result, EPA delayed its risk assessment again in order to review IARC's report and conduct its own comprehensive evaluation.

Background:

- In 2016, EPA held a FIFRA Scientific Advisory Panel (SAP) meeting to discuss the carcinogenic potential of glyphosate. Currently, EPA is reviewing and considering the SAP's recommendations.
- EPA was originally scheduled to release its risk assessment in 2014. This was delayed due to receipt of a petition from the NRDC to curb the use of glyphosate, on the grounds that it was killing milkweed, a key resource for the monarch butterfly.

Q. What is EPA's current schedule for the review of glyphosate?

Answer:

The draft human health and ecological risk assessments for glyphosate will be completed in late 2017 and published for public comment in early 2018.

Background:

EPA is currently evaluating glyphosate as part of registration review and will open a 60-day public comment period for its risk assessments. The Proposed Interim Decision (PID) is scheduled to publish in 2019, which would weigh the risks and benefits of the use of glyphosate and outline proposed measures to address identified risk (i.e., risk mitigation measures), if needed. After public comments on the PID are reviewed, EPA will issue an Interim and implement any necessary label changes. EPA's registration review decision will remain interim until the agency completes a national-level endangered species assessment. If EPA determines that glyphosate may affect listed species, EPA will initiate consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. EPA is scheduled to complete endangered species effects determinations and initiate consultation with the Services for glyphosate by 2020.

Dietary Exposures

Q. Is glyphosate used on genetically modified organisms and is it safe to consume GMOs with residues of glyphosate?

Answer:

Glyphosate is used on a variety of crops, including certain genetically engineered plants (also known as GMOs). Uses of glyphosate on genetically engineered plants are assessed for risks to human health when they are first added to the pesticide label, and EPA determined that residues of glyphosate from genetically engineered plants are safe for consumers provided the use complies with the existing labels.

Q. Given recent reports that glyphosate was detected in food/drink that children regularly consume, should parents be especially concerned?

Answer:

Due to its widespread use, trace amounts of glyphosate residues may be found in various food and beverage commodities. However, EPA is required under the law to be protective of children

in its risk assessment process and has not identified any concerns for children in its most recent 2012 human health risk assessment

Q. Has glyphosate been detected in breast milk?

Answer:

EPA is not aware of any peer-reviewed studies reporting glyphosate residues being detected in human milk.

Background:

The 2012 risk assessment was conducted in support of the registration of new uses on several crops.

Food and food ingredients derived from genetically engineered plants are primarily regulated by the Food and Drug Administration (FDA) and must adhere to the same safety requirements that apply to food and food ingredients derived from traditionally bred plants. EPA has a statutory requirement to evaluate all pesticides and ensure that there is a "reasonable certainty of no harm" when pesticides are applied according to the label, which includes application to genetically engineered plants. Plants genetically engineered to be tolerant to glyphosate include corn, soybean, sugar beet, cotton, wheat, alfalfa, and canola.

Moms Across America, an advocacy group, analyzed 10 human milk samples and claimed glyphosate was detected in a subset of these samples (3 samples); however, EPA identified several methodological issues that would prevent the Agency from using the results. Subsequently, Washington State University scientists published data in a peer-reviewed journal demonstrating that glyphosate was not detected in 41 human milk samples. These analyses were conducted both in Monsanto laboratories and independently verified at Covance laboratories, which is not affiliated with Monsanto or Washington State University. The EPA has obtained 39 human milk samples from the National Institutes of Health (NIH) to analyze for the presence of glyphosate and the results will be included in the Registration Review docket for glyphosate with the preliminary human health and ecological risk assessments.

Q. The International Agency on the Research for Cancer (IARC) determined in 2015 that glyphosate is likely to cause cancer. What is EPA's position on this and how is this information being considered?

Answer:

EPA performs its own independent evaluation of available data to determine the carcinogenic potential of a pesticide, which includes all available animal carcinogenicity, mutagenicity, and epidemiology data. Following IARC's classification of glyphosate as "probably carcinogenic to humans (Group 2A)," EPA conducted a comprehensive analysis of all the available data to inform the human carcinogenic potential of glyphosate and concluded glyphosate is "not likely to be carcinogenic to humans at doses relevant for human health risk assessment." In December 2016, EPA's evaluation was reviewed by the FIFRA Scientific Advisory Panel (SAP). The SAP released a report in March 2017 and EPA will respond to this report as part of its draft human health risk assessment to support Registration Review.

Q. Why does EPA disagree with the IARC assessment? How can EPA and IARC come to different conclusions about glyphosate's ability to cause cancer?

Answer:

EPA's cancer classification for glyphosate is based on a weight of evidence evaluation in accordance with the Agency's 2005 Guideline for Carcinogen Risk Assessment. The dataset considered by EPA included studies submitted for registration of glyphosate, as well as studies identified in the open literature as part of a systematic review. IARC only considers data that has been published or accepted for publication in the openly available scientific literature. As a result, IARC only considered a subset of the cancer studies included in the EPA evaluation.

Background:

IARC's conclusion is inconsistent with the international community whereas EPA's conclusion is consistent with other countries and regulatory authorities including Canada, Australia, European Food Safety Authority (EFSA), Germany, The Joint FAO/WHO Meeting on Pesticide Residues (JMPR), European Chemicals Agency (ECHA), Japan, New Zealand

Q. It was recently reported that Aaron Blair, who chaired the IARC deliberations for glyphosate, and who is also co-author of the Agricultural Health Study (AHS), did not disclose unpublished findings for glyphosate from the AHS that would have informed IARC's glyphosate cancer classification. The data strongly suggested that glyphosate did not cause cancer. Did EPA have access to this data? Would it have an impact on EPA's cancer evaluation?

Answer:

EPA did not have access to recent unpublished data for glyphosate from the Agricultural Health Study (AHS) at the time of its 2016 cancer evaluation. EPA noted that the data in this unpublished journal manuscript support no association between glyphosate exposure and lymphoma risk, which is consistent with the EPA's conclusion that glyphosate is "not likely to be carcinogenic to humans at doses relevant for human health risk assessment." These findings have not been peer-reviewed; however, EPA anticipates a new evaluation from AHS regarding glyphosate exposure and lymphoma risk that will be published in a peer-reviewed journal in the coming months.

Question:

As part of ongoing litigation involving Monsanto, it has also been reported that EPA employees (specifically Jess Rowland) colluded with Monsanto to maintain that glyphosate does not cause cancer. What is EPA's response to these reports?

Answer:

There was no collusion between EPA staff and representatives of Monsanto. EPA employees maintain a high level of ethical conduct to maintain the public trust.

Background:

When a chemical is under review, EPA maintains a dialogue with the pesticide registrants in order to obtain information needed for risk assessment or risk management. EPA routinely meets

with other interested stakeholders to discuss chemicals under review, including environmental groups and activist groups. Reports of alleged conversations between EPA officials and a chemical registrant was taken out of context are not evidence of collusion.

Q. Is it true that glyphosate is linked to Parkinson's disease and non-Hodgkin's lymphoma?

Answer:

No, the available scientific data, including the previously undisclosed glyphosate data from the Agricultural Health Study, do not support a cause and effect relationship between exposure to glyphosate and Parkinson's or non-Hodgkin's lymphoma.

Background:

If, at any time, reliable data are available that suggest unexpected risks due to glyphosate exposure, the agency will ensure the data are evaluated and move quickly to take the appropriate regulatory actions, when necessary.

Q. Why is California listing glyphosate as a cancer agent under Proposition 65?

Answer:

IARC has been identified as a designated authoritative body under Proposition 65; therefore, given IARC's classification of "probably carcinogenic to humans", glyphosate has been listed in California.

Background

As of July 2017, the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) is listing glyphosate as an agent known to the state to cause cancer under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Proposition 65 requires California to publish (at least) yearly a list of chemicals known to the state to cause cancer or birth defects or reproductive toxicity. One of the ways for a chemical to be added to the Proposition 65 list is if an "authoritative body" has identified it as an agent causing cancer.

Q. Is glyphosate an endocrine disruptor?

Answer:

Based on all available information, EPA concluded using a weight of evidence approach that the existing data do not indicate that glyphosate has the potential to interact with the estrogen, androgen, or thyroid signaling pathways.

Background:

Glyphosate has undergone Tier I screening under EPA's Endocrine Disruptor Screening Program (EDSP) and was not recommended under EDSP for additional testing.

Q. There's widespread weed resistance to glyphosate. What is EPA doing about weed resistance?

Answer:

Implementing measures that promote proper weed resistance management is a high priority for the agency. In 2016, EPA published for public comment draft weed resistance management guidance for herbicide labeling, education, training, and stewardship. Final guidance will be issued later this year.

Background:

EPA is working actively with a wide range of stakeholders, including USDA and the Weed Science Society of America, and will continue to expand work with affected stakeholders to implement this new weed resistance management guidance.

Q. Glyphosate kills milkweed, a key resource for the monarch butterfly. What is EPA doing to protect the monarch butterfly?

Answer:

EPA believes that monarch conservation is important and in 2015 published and took public comment on a risk management approach intended to identify options to protect the monarch butterfly. EPA sought information relating to the impact of herbicides on milkweed and encouraged stakeholders to submit information on existing practices that promote the co-occurrence of agricultural production with milkweed maintenance. EPA has evaluated the comments received and will issue a revised risk management approach, outlining a multi-pronged strategy for managing risks to monarch butterflies from the use of herbicides.

Background:

On June 24, 2015, EPA published the document titled "Risk Management Approach to Identifying Options for Protecting the Monarch Butterfly"

Glyphosate is an herbicide and is registered for use to treat milkweed, which is considered a weed in agricultural settings. Glyphosate, like all similar herbicides, may indirectly affect the monarch butterfly by affecting milkweed resources. However, it is not known to what extent herbicide use in general may contribute to the decline of the monarch butterfly. EPA believes that various factors are contributing to the decline of the monarch butterfly, including loss of overwintering habitat in the Sierra Madre mountains of Mexico.

Q. Recently, a collection of 20,000 documents from several sources, including EPA, were published online. The collection, with documents dating back to the 1920s, was termed the "Poison Papers." Environmental activists allege that the documents contain correspondence which show that Monsanto doctored scientific studies in order for regulatory agencies to view glyphosate in a favorable light. What is EPA's response to this?

Answer:

EPA is aware of the "Poison Papers" and has not had a chance to review all the documents, and therefore cannot comment on the allegations.

Background:

- EPA is always concerned when there are suspected fraudulent studies. However, it is hard to know exactly what is in this tremendous collection of documents.
- EPA will continue to rely on the best scientific data available for its evaluation of glyphosate. The glyphosate dataset is composed of thousands of studies and consists of data from a variety of sources, including other pesticide companies, academia, and published scientific literature.
- We look closely at every study to determine whether the results are scientifically sound. Our analysis gives greater weight to high quality and well documented studies and those findings confirmed by multiple sources.

Organophosphates

Q. What is the agency's plan for completing its re-evaluation of the organophosphates (OPs)?

Answer:

EPA has released two Proposed Interim Decisions as well as two Interim Decisions for the organophosphates. The rest of the decisions are scheduled for completion by 2022.

Between September 2015 and May 2017, the agency released preliminary risk assessments for 18 of the organophosphates going through registration review. For 6 of the organophosphates, the preliminary risk assessments are still in progress and/or pending release.

Background:

In making a risk management decision under FIFRA (for occupational and ecological risks), the agency takes into account the economic, social, and environmental costs and benefits of the use of any pesticide. However, under FQPA (for dietary and residential risks), the agency must meet safety standards regardless of other factors. The Proposed Interim Decisions will outline proposed measures to lessen any unreasonable risk.

After the 60-day public comment periods for the preliminary risk assessments closes, the agency evaluates the comments received and considers any potential risk management options for the pesticides. After public comments on the Proposed Interim Decision are evaluated, EPA will issue an Interim Decision for each organophosphate. Implementation of any labeling changes for the organophosphates would occur subsequently. EPA must also complete the cumulative risk assessment for the organophosphates

Q. In nearly all of the draft OP human health risk assessments released to date, the agency has included an FQPA 10X safety factor for neurodevelopmental effects, largely based on epidemiological data. Is the use of epidemiological data for risk assessment purposes typical?

Q. Do you support the use of epidemiological data for risk assessment purposes?

Q. Do you support the use of the FQPA 10x safety factor in the OP risk assessments?

Answer:

The agency plans to release for public comment a petition from CropLife America asking the agency to halt regulatory decisions that use epidemiological studies that do not meet certain data quality standards and that are not integrated into the health risk assessment in a transparent, well defined manner. EPA will consider the comments before responding to the petition and as it moves forward with current human health risk assessments. [Note: this may happen before the hearing.]

Under FQPA (1996), the 10X factor is required unless reliable data support the use of a different factor. In 2014, EPA determined that reliable data were not available to reduce the FQPA 10X factor. EPA recently released the *Office of Pesticide Programs' Framework for Incorporating Human Epidemiologic & Incident Data in Risk Assessments for Pesticides*, which describes how EPA identifies and evaluates epidemiology studies and considers these studies in combination with laboratory studies.

Background:

The agency has conducted a thorough review of the scientific literature on the potential for exposure organophosphate pesticides to result in adverse effects on the developing brain. Many of these studies were also reviewed by three separate FIFRA Scientific Advisory Panels. The FIFRA SAP has questioned the agency's historical approach of conducting risk assessments for these pesticides as not being sufficiently health protective. EPA continues to evaluate emerging scientific evidence. Moreover, EPA is actively engaging the scientific community in order to build consensus on the appropriate approach for the human health risk assessments.

Q. CropLife America submitted a petition to the agency in November 2016. The petition asks the agency to "halt regulatory decisions that are highly influenced/determined by results of epidemiological studies that do not meet well-defined data quality standards and that are not integrated into the health risk assessment in a transparent, well defined manner." The agency has remained silent on this petition. How will you move the response to the petition forward?

Answer:

The agency plans to release the petition for a 30-day public comment period and will consider the comments before responding to the petition and as it moves forward with current human health risk assessments. [Note: this may happen before the hearing.]

Background:

In December 2016, EPA completed and subsequently released the *Office of Pesticide Programs' Framework for Incorporating Human Epidemiologic & Incident Data in Risk Assessments for Pesticides*, which describes how EPA identifies and evaluates epidemiology studies and considers these studies in combination with laboratory studies.

EPA has made the petition available to the public, via the docket for various chemicals going through registration review, but hasn't taken comment or responded to it yet.

Q. Recent assessments on chlorpyrifos, malathion and diazinon, three organophosphates, indicate that these chemicals are harmful to many threatened and endangered species. What will you do to mitigate the risk to these threatened and endangered species?

Answer:

EPA released its Biological Evaluations for chlorpyrifos, malathion and diazinon in January 2017 and expects to receive draft Biological Opinions from the Fish and Wildlife Services and National Marine Fisheries Service (referred to as The Services) for these three pesticides. The agency anticipates releasing the Draft Biological Opinions for public comment before the final Biological Opinions are issued. Once the agency reviews the Services' final Biological Opinions and any public comments, the agency will consider the reasonable and prudent measures and reasonable and prudent alternatives identified by the Services.

Q. How does EPA plan to respond to requests from industry to retract the Biological Evaluations for the 3 OPs given that they were based on "flawed scientific methods?"

Answer:

The methods used to evaluate possible effects to Threatened and Endangered species from potential exposure to malathion, diazinon, and chlorpyrifos were developed jointly with Fish and Wildlife Services and National Marine Fisheries Service (referred to as The Services). The methods are intended to be interim, and work is ongoing to refine and streamline these methods based on feedback and comments received from external stakeholders.

Background:

The Biological Evaluations (BEs) are the first steps in the overall endangered species assessment consultation process. The draft Biological Opinions, which are based on the BEs, are currently being developed by the Services. Once the draft Biological Opinions have been reviewed and subjected to public comment, EPA will determine the most appropriate course of action.

Q. The registration review of the OPs is proceeding slowly, especially given the risks of concern identified in the preliminary risk assessments. Why is the OP review so lengthy and complex, and what will you do to move it along?

Answer:

EPA bases its decisions on a thorough evaluation of the best available scientific information. As the preliminary risk assessment for the OPs have been released to the public, registrants have responded to concerns by generating additional data. The agency intends to consider the additional data and determine whether additional refinements to the risk assessments are necessary. The agency's mitigation decisions for the OPs will depend on the risks identified for each chemical and, when appropriate under FIFRA, consideration of the benefits. The agency is committed to completing registration review for the OPs by 2022.

Endangered Species Act

Q: Is EPA proposing any changes to its plans for assessing the risk of pesticides for endangered species?

Answer:

The current schedule for completing the initial set of biological evaluations has not changed.

- EPA released the biological evaluations for chlorpyrifos, diazinon, and malathion in January 2017, and their biological opinions are scheduled to be completed at the end of 2017.
- The Services are currently scheduled to complete biological opinions for methomyl and carbaryl by December 2018.
- EPA is currently scheduled to complete effects determinations and initiate consultation for atrazine, simazine, propazine, and glyphosate by 2020.

EPA, National Marine Fisheries Service and Fish and Wildlife Services (the Services) are currently involved in discussions exploring possible options for streamlining the interim methods and process we have developed based on the recommendations of the National Academy of Sciences in its April 2013 report. EPA is also currently considering a request that the first three biological evaluations be remanded to allow for further refinement of the interim process.

Background:

The NAS recommendations for assessing risk from pesticide exposure to threatened and endangered species involves a 3-step process that integrates ecological risk assessment methods with ESA consultations. EPA, NMFS, FWS and USDA held several workshops to develop those interim methods, which were intended to be part of an iterative process that continues to evolve as EPA and the Services gain experience with the process. EPA used those interim methods in the biological evaluations for chlorpyrifos, diazinon, and malathion, which were released in January 2017. On April 13, 2017, registrants for these pesticides sent letters to the political leadership of the EPA and the Services requesting the EPA withdraw the BEs, the Services stop work on their BiOps, and modify the settlement agreements to allow more time to complete consultation. The EPA is considering the request.

PRIA4

Q: Does the FY 2018 budget provide the staff and resources needed to adequately assess the risk of pesticides for these species?

Answer:

Yes, the FY 18 President's budget provides the staff and resources needed to adequately assess the risk of pesticides to endangered species.

Background:

Currently, registration user fees can cover a portion of the costs associated with the assessment of risks to endangered species. If PRIA 4 passes, it will also have language that will explicitly cover allowing the use of maintenance fees funding to cover the costs of endangered species activities; although currently under FIFRA, nothing prevents the EPA from using maintenance fees for endangered species activities.

Q. What is the current status of PRIA 4?

Answer:

The reauthorization of the Pesticide Registration Improvement Act (PRIA 4) passed in the House (H.R. 1029) in March 2017 as a 7-year extension with two 5% fee increases in that time frame. The amended bill passed the Senate Agriculture Committee as a 3-year authorization with no fee increases and has not gone to vote in the Senate due to a hold.

Q. Do you support the passage of PRIA 4 and what would be the impact on EPA and pesticide registrations if PRIA 4 does not pass into law?

Answer:

Yes, I support the passage of PRIA 4. It's not passed by September 30, 2017, when PRIA 3 sunsets, pesticide applications received after October 1, 2017, will no longer be subject to decision time periods; fees would be reduced in the first year by 40% below 2017 levels and by 70% in the second year and then would be terminated. Loss of an estimated \$17 million a year in PRIA fees and \$31 million a year in maintenance fees would impact the program's ability to meet its statutory responsibilities to register and re-evaluate pesticides.

Background:

- EPA has provided technical assistance to the House, the Senate, Congressional Budget Office, Office of Management and Budget, and a coalition of pesticides stakeholders supporting the bill.
- PRIA establishes a fee for service framework that charges applicants based on the type and complexity of the activity requested. It permits market access to pesticides within predictable time frames, benefitting both the pesticide and agricultural industries, while safeguarding the environment and human health. Growers and other pesticide users can thus rely on innovative products to be available when pest pressures occur, including existing and emerging public health pests.
- PRIA 4 would provide continued funding for the statutorily required reevaluation of existing pesticides, which is important to both the crop protection industry and the environmental and public health community. The legislation provides incentives for actions supporting reduced risk pesticides and funds are made available to advance worker protection and pesticide applicator safety training.
- PRIA 4 brings together broad coalition of stakeholder groups representing seven pesticide industry trade groups and two non-governmental organizations, which has paved the way to expedited approval processes in Congress to pass the original law and its amendments to extend.

- The fees fund a portion of the EPA's pesticides registration and registration review activities and help support staff and other expenses related to pesticides registration and registration review.
- PRIA allows partial fee waivers for small businesses and exempts federal and state government entities from fee requirements. Applications supported by the IR-4 Project, a USDA-funded program which supports the availability of pest management tools for growers of minor use crops, are likewise exempt from fee requirements.
- Since PRIA initially became law in March 2004, the EPA has approved over 20,000 pesticide applications, meeting or beating mandated due dates for over 98% of those actions.

Neonicotinoids

Q. With all the available studies describing effects of neonicotinoids on bees, why can't we definitively determine whether neonicotinoids are responsible for declines in bee populations?

Answer:

The prevailing understanding among scientists in EPA, USDA, the National Academy of Sciences, and the global scientific and regulatory community is that the general declining health of honey bees is related to complex interactions among multiple stressors*. Precisely isolating the role of one of these stressors in overall declines in honey bee health has been a challenge.

Background:

Multiple stressors*: pathogens (viral, bacterial and fungal diseases), pests (*e.g.*, Varroa mite), poor nutrition (*e.g.*, loss of foraging habitat), bee management practices (*e.g.*, long migratory routes to support pollination services), lack of genetic diversity, and pesticide exposure.

While many studies have been published on the effects of neonicotinoids on honey bees, the quality and design of these studies differ widely, as does their overall conclusions. EPA has applied a consistent process, using reproducible study designs and conclusions for evaluating the potential effects of pesticides on bees that has been vetted through numerous FIFRA Scientific Advisory Panels. The process being used by EPA to evaluate potential risks to bees is a tiered approach that ultimately examines the potential effects on honey bee colonies under increasingly realistic use conditions, with a concordance of information across multiple studies and study types.

Q. What action is the EPA taking to protect bees from neonicotinoid pesticides?

Answer:

In 2013, EPA imposed labelling requirements for neonicotinoid insecticides prohibiting the use of certain neonicotinoids when managed honey bee colonies are present. These requirements are intended to reduce acute exposure to managed honey bee colonies. In January 2017, EPA issued a policy* to protect bees from foliar applications of acutely toxic pesticides while bees are under contract to provide pollination services. The Policy provides flexibility that balances pollinator

protection with crop production, and recommends that states and tribes develop pollinator protection plans and best management practices to protect bees.

Background:

****Policy to Mitigate the Acute Risk to Bees from Pesticide Products***

EPA has been working aggressively to protect bees and other pollinators from pesticide exposure, developing and implementing new policies while it continues to refine its methods and assess risks to bees. EPA is also continuing its registration review, and will follow its statutory responsibility to consider both risks and benefits in proposing and determining a regulatory path for the neonicotinoid pesticides.

Q. What action is EPA taking to address bee kill incidents resulting from dust-off from seed treatment applications?

Answer:

EPA has relied on practical, management measures* to reduce potential exposure from drift of abraded seed coat dust (dust-off) during seed planting. EPA continues to work with stakeholders to explore additional opportunities to reduce drift from dust generated during the planting of pesticide-treated seed.

Background

*Management measures: Development of a treated seed stewardship manual by the American Seed Trade Association; Development of alternative fluency agents to reduce the quantity of dust generated during planting; Improved design guidelines issued by the International Organization of Standards for agricultural planting equipment to reduce seed dust

EPA has identified that drift of abraded seed coat dust (dust-off) during seed planting operations is a potential route of pesticide exposure for pollinators. However, the extent to which dust-off occurs can vary widely due to seed quality, seeding equipment, fluency agents and weather. Given these multiple sources of variability, it is difficult to develop a suitable model for evaluating such exposure.

EPA is a member of the Corn Dust Research Consortium, a public-private partnership that has researched this potential route of exposure to bees and has in turn developed recommendations for further reducing exposure.

Q. Why hasn't the EPA banned neonicotinoids similar to what has been done in Europe or what is planned in Canada?

Answer:

At the time of the European Food Safety Authority (EFSA) assessment of neonicotinoids, EPA didn't have sufficient data to indicate uses would fail to meet the FIFRA standard. Also, at that time, EPA was developing its pollinator risk assessment framework along with identifying data needed to inform that framework. New pollinator data has since come in and as a result EPA's assessment differs from EFSA's, because it incorporates the new data reflecting how the state of the science has progressed between 2013 and now. Canada's recent proposed measures have

been based on risk to aquatic species (not bees). EPA plans to release its remaining assessments of risk to aquatic species in September 2017.

Background:

The EFSA assessed the available studies for the neonicotinoids and their impact on bees. Based on the conclusions from these studies in 2013, it suspended certain uses of clothianidin, thiamethoxam, and imidacloprid in the EU. As a result of the uncertainty, EFSA temporarily suspended the marketing of treated seed with neonicotinoids until a more thorough analysis could be completed to address uncertainties.

EPA is currently in the process of reviewing these data and incorporating them into its updated pollinator assessment, planned for 2018. EPA has been cooperating with Canada's Pest Management Regulatory Agency (PMRA) in further developing the science of pesticide risk to pollinators. Canada's recent proposed measures have been based on assessments of risk to aquatic species. EPA plans to release its remaining assessments of risk to aquatic species in September 2017.

Q. What is EPA's plan for completing its review of the neonicotinoids?

Answer:

EPA has completed preliminary pollinator risk assessments for all four of the neonicotinoid insecticides. Updated pollinator assessments for all four compounds will be issued in 2018. EPA intends to complete draft risk assessments for human health and other non-pollinator ecological taxa, as well as benefits assessments, for all four active ingredients by September 2017

Background:

After public comment is received on these assessments, EPA will evaluate the comments received, consider the risks and benefits of the neonicotinoid pesticides, and develop appropriate risk management options for these insecticides. All proposed risk management measures are released for public comment before they are finalized.

Q. Does the EPA plan to assess the neonicotinoids for risk to pollinators other than honey bees?

Answer:

EPA's bee risk assessment framework uses the honey bee as the representative (surrogate) species for all bees due to well-established test methods for honey bees. Additional data will be evaluated on bumble bees and other bee species, and characterized in EPA's final pollinator assessments planned in 2018.

Background:

In contrast to other bee species, the honey bee's ready availability, the relative ease in which it can be reared, and its ability to tolerate testing conditions makes it a good test species. These factors contribute to more reliable data on which to base decisions. As part of the preliminary risk analyses for the neonicotinoids, EPA reviewed the available data with other bee species and

found that, at the individual-level, the honey bee appears to be a good surrogate for other bee species.

Q. What will happen to growers if neonicotinoid pesticides are banned? Will they suffer significant economic impact?

Answer:

The neonicotinoids are cost effective and have been incorporated into many Integrated Pest Management (IPM) programs developed by agricultural research and extension programs. These chemicals contribute substantially to the economy and serve an important role in IPM.

Background:

In many cropping systems neonicotinoids serve an important role in IPM because they are broad-spectrum and systemic, which serves to reduce the use of multiple other insecticides and the frequency of insecticide applications. In certain cases, such as citrus in Florida, the need for the neonicotinoids to aid in addressing citrus greening, has been critical. As EPA continues its reevaluation of this class of compounds, we will be assessing the benefits that these products have in meeting pest control needs.

EPA is conducting benefits assessments of the impacts of potential ways to address risks for certain neonicotinoid uses, *i.e.*, those uses identified as posing risks to bees. These benefits assessments will identify and describe the utility of the neonicotinoids, and the likely alternative insecticides, along with the impacts on growers if they were forced to use these alternatives in lieu of neonicotinoids on certain crops (cotton, citrus, and cucurbits). When released, the assessments will be made available for public comment.

Atrazine

Q. Is EPA aware of the published studies in scientific literature linking atrazine exposure to cancer, birth defects and other health outcomes?

Answer:

The Agency is aware of some published literature on atrazine and possible associations with cancer, birth defects, and other health outcomes, and continues to actively monitor and consider these types of studies as a part of the registration review process.

Q. Why has it not taken action based on these findings?

Answer:

Over the years we have consulted the FIFRA Scientific Advisory Panel (SAP) several times on atrazine and human health issues, and the SAP has largely been supportive of EPA's approach. After EPA completes its human health risk assessment for atrazine, EPA will consider whether action is necessary to address human health risks.

Background:

The human health risk assessment for atrazine evaluates the safety of pesticides. EPA uses a weight-of-evidence approach that incorporates consideration of all relevant, robust, and scientifically-sound information, including published literature, laboratory studies required by EPA to obtain or maintain registration, and information submitted by the public.

Q. Why does EPA's Office of Pesticide Programs and Office of Water have such different regulatory limits for atrazine in drinking water?

Answer:

The two offices operate under different governing statutes and accomplish the goal of protecting drinking water in different ways.

Background:

The Office of Pesticide Programs sets and enforces requirements and restrictions on pesticide use to ensure that each pesticide does not cause unreasonable adverse effects on human health or the environment, including drinking water. The Office of Water regulates drinking water more broadly by establishing and enforcing drinking water standards that limit the level of drinking water contaminants, including pesticides, and by requiring regular monitoring to ensure that the standards are being met.

Consistent with EPA's mission to protect human health and the environment, EPA's Office of Pesticide Programs and Office of Water both contribute to protecting drinking water resources in the United States. The two offices operate under different governing statutes and accomplish the goal of protecting drinking water in different ways. The Office of Pesticide Programs is updating its drinking water and human health risk assessment based on a comprehensive review of the newest scientific data available. This information will be available to the Office of Water when it reassesses regulatory limits for atrazine in water.

Q. Why is atrazine registered in the U.S. when it is cancelled in EU?

Answer:

EPA's approach to pesticide regulation is based on U.S. federal law, which requires a process that considers not only the pesticide's specific hazard (i.e., toxicity) but also the risk it may pose based on both hazard and exposure (risk = hazard x exposure). The EU's approach treats all pesticides alike, regardless of how toxic different pesticides may be or whether it poses a risk.

Background:

The E.U. has established a specific limit (0.1 ppb) for any pesticide in water, regardless of the level of risk.

The E.U. banned atrazine because of monitoring data showing that levels of atrazine might exceed the European legal limit of 0.1 ppb. EPA will permit a level of a particular pesticide to be present, depending on the degree of risk posed by a pesticide. This is the model upon which many countries base their own pesticide regulations.

Q: The EPA's Final Work Plan (2013) lists the estimated date for publication of a Registration Review Decision on Atrazine in 2016. Why has it not been released yet?

Answer:

The ecological risk assessment was released in 2016. However, the human health risk assessment was delayed to allow for incorporation of data from a physiologically based pharmacokinetic (PBPK) model and to allow for a peer review of the model and the risk assessment approach.

Background:

EPA expects to release the human health risk assessment for atrazine in 2018 and issue a decision in 2019.

Q: EPA's 2016 ecological assessment showed a number of risks to the nation's water and ecological well-being. Is EPA cancelling atrazine or requiring rate reductions or any other mitigation?

Answer:

No mitigation or changes to atrazine registrations will occur until the Agency completes its review of the public comments on the ecological assessment, completes and takes public comment on the human health risk assessment, and conducts a benefit assessment that weighs the economic costs against the environmental benefits of any possible risk mitigation, as required by FIFRA.

Background:

Based on the results of the risk assessment, aquatic plant communities are affected in many areas where atrazine use is heaviest, and there is potential chronic risk to fish, amphibians, aquatic, mammals, birds, reptiles and plants.

The 2016 ecological risk assessment reflects updated science, uses geographically explicit modeling and available water monitoring data, and incorporates the Scientific Advisory Panel (SAP) recommendations over the past decade. The findings of this risk assessment present the preliminary ecological risks associated with atrazine, and will be relied on, along with information about the benefits of atrazine, for the Registration Review decision.

The Agency received over 50,000 comments on the 2016 atrazine ecological risk assessment. Many commenters expressed the importance of atrazine use for farmers and foresters, citing improved yields, low cost, reduced need for tillage resulting in reduced erosion, effective weed control, and its utility in resistance management. The Agency anticipates publication of an Interim Registration Review Decision for public comment in 2019.

Q: What is the EPA conclusion regarding whether atrazine has detrimental effects on amphibians?

Answer:

In EPA's draft ecological risk assessment, published for public comment in June 2016, the Agency concluded in a weight-of-evidence analysis that there is a potential for chronic risk to

amphibians. The agency is now considering comments submitted in response to the draft ecological risk assessment.

Background:

EPA's conclusion was based on a comparison of atrazine concentrations that resulted in effects on growth, reproduction and survival of amphibians in the scientific literature to measured and predicted surface water concentrations.

Q. How is EPA protecting endangered species from atrazine exposure?

Answer:

By December 2020, the agency intends to complete a nationwide endangered species effects determination for the triazine herbicides, which includes atrazine. After completion of that effects determination, if necessary, the agency will initiate consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, as required by the Endangered Species Act.

OFFICE OF POLLUTION PREVENTION AND TOXICS (OPPT)

TSCA Implementation Activities

Q: The 2016 amendments to TSCA created significant new obligations for the EPA and OCSPP, in addition to many prior responsibilities. What are your views on how implementation of the law has gone thus far, and what changes in direction do you foresee, if any?

Answer:

I commend EPA for working so quickly and efficiently to implement the many provisions of TSCA, as amended. OCSPP was able to finalize all the key framework rules on time, and completed a host of other accomplishments on time or, in some cases, ahead of schedule. I look forward to the challenges that lay ahead, including prioritizing high- and low-priority substances, conducting risk evaluations consistent with the law and best available science, and ensuring that EPA delivers on TSCA's promise for increased chemical safety and marketplace certainty.

Background:

The EPA will continue to seek input from stakeholders on critical implementation elements of TSCA as amended. Since June 2016, EPA has held an unprecedented number of public meetings seeking input from affected entities. Moving forward EPA will focus on continuing to reduce review times and seeking additional feedback through a public meeting for the new chemicals program; providing additional opportunities on and finalizing a process for identifying candidate chemicals and information needs prior to prioritization; working towards designating 20 High-Priority and 20 Low-Priority chemicals by the end of 2019; issuing "Problem Formulation" documents that further refining the "Scope" documents published on June 22, 2017; issuing draft risk evaluations for the first 10 chemicals under review and taking public comment; proposing and finalizing a rule to partially defray implementation costs; implementing the reporting requirements of TSCA, as amended, to determine whether a chemical is active or inactive in commerce; developing a Strategic Plan for advancing the use of non-animal testing; proposing and finalizing a rule to help inform future version of the Mercury Inventory; and proposing and finalizing rulemaking to address exposures from persistent and bio-accumulative chemicals.

TSCA Framework Rules: Active/Inactive Inventory Rule

Q: What value do you see in the information gained from the reporting requirements of the active/inactive inventory rule?

Answer:

After the reporting period is complete, EPA will then designate all chemical substances on the TSCA Inventory as either active or inactive. The inventory designations will be helpful, from an exposure perspective, to inform the Agency's subsequent identification of existing chemicals for prioritization and potentially further evaluation.

Background:

TSCA requires EPA to designate chemical substances on the TSCA Chemical Substance Inventory as either "active" or "inactive" in U.S. commerce. To accomplish that, EPA finalized a

rule on June 22, 2017 requiring industry reporting of chemicals manufactured (including imported) or processed in the U.S. over the past 10 years, ending on June 21, 2016. August 11 marked the start of a 180 reporting period, to end February 7, 2018, for manufacturers and importers to notify the Agency of the status of their chemicals. All processors of chemicals also have an opportunity to report, and may do so by October 5, 2018. This reporting will be used to identify which chemical substances on the TSCA Inventory are active in U.S. commerce and will help inform the prioritization of chemicals for risk evaluation. Additionally, active and inactive designations for each chemical substance will be included as part of the Agency's regular publications of the TSCA Inventory. EPA will be hosting webinars to assist submitters this fall. Further details will be posted.

Prioritization Rule

Q: Are you aware that a number of lawsuits have been brought against the recently finalized Prioritization rule? Does this concern you? Why or why not?

Answer:

Yes, there have been three lawsuits brought against the Prioritization Rule to date. I am not aware of the underlying basis of the litigation, so it is difficult to comment further.

Background:

The Agency is currently working to consolidate the petitions in a single circuit, because they are currently in 3 different courts. The process will then go as follows: First the Agency will submit the petitions filed and served on the Agency to the Judicial Panel on Multidistrict Litigation. 28 U.S.C. § 2112(a)(1). The Panel then randomly selects a court from among those where petitions were filed in which all cases will be consolidated and the agency will file the record. Id. § 2112(a)(3).

Organizations suing: Safer chemicals healthy families; Alaska community action on toxics; Environmental health strategy center; Environmental working group; Learning Disabilities Association of America; Sierra club; Union of concerned scientists; United steel, paper and forestry, Rubber, manufacturing, energy, Allied industrial and service workers international union, AFLCIO/CLC; We Act for Environmental Justice; Asbestos Disease Awareness Organization; Vermont Public Interest Research Group; Environmental Defense Fund; Alliance of Nurses for Healthy Environments; NRDC; Cape Fear River Watch

Q: In the final prioritization rule, EPA decided to remove the process known as 'pre-prioritization'. Do you agree with the reasoning behind this decision?

Answer:

In reviewing the public comments on the proposed rule, it is clear that commenters shared diverse views on this provision that were often irreconcilable. I support EPA's decision to defer final action on this provision until there has been further discussion with the stakeholder community, including the additional public comment opportunity.

Q: *What do you see as the goal for a ‘pre-prioritization’ phase?*

Answer:

I see this process as helping the Agency to identify potential candidates for prioritization. The prioritization process itself determines whether a particular chemical is designated as a Low-Priority and set aside, or as High-Priority and further evaluated. But as a matter of responsible implementation and given the tight statutory deadlines, the Agency needs to start binning chemicals earlier and identifying information needs. A pre-prioritization process should inform the information and data landscape for the tens of thousands of chemicals on the TSCA inventory, and give the public an additional opportunity to engage the Agency early in the process of reviewing existing chemicals.

Risk Evaluation Rule

Q: *What is the status of lawsuits brought against this rule?*

Answer:

There have been three lawsuits brought against the Risk Evaluation Rule. To date (Sept 1, 2017) the Agency has not been made aware of the underlying basis of the litigation.

Background:

The Agency is currently working to consolidate the petitions in a single circuit, because they are currently in 3 different courts. The process will then go as follows: First the Agency will submit the petitions filed and served on the Agency to the Judicial Panel on Multidistrict Litigation. 28 U.S.C. § 2112(a)(1). The Panel then randomly selects a court from among those where petitions were filed in which all cases will be consolidated and the agency will file the record. Id. § 2112(a)(3).

Organizations suing: Safer chemicals healthy families; Alaska community action on toxics; Environmental health strategy center; Environmental working group; Learning Disabilities Association of America; Sierra club; Union of concerned scientists; United steel, paper and forestry, Rubber, manufacturing, energy, Allied industrial and service workers international union, AFLCIO/CLC; We Act for Environmental Justice; Asbestos Disease Awareness Organization; Vermont Public Interest Research Group; Environmental Defense Fund; Alliance of Nurses for Healthy Environments; NRDC; Cape Fear River Watch

Q: *Please describe your understanding of the Agency’s approach to identifying ‘conditions of use’ under TSCA.*

Answer:

“Conditions of use” must be interpreted in the context of the overall objective in TSCA: to ensure that within the statutory deadlines, the Agency is conducting a timely, relevant, high-quality, and scientifically credible evaluation of a chemical substance as a whole, on the conditions of use that raise the greatest potential for risk. As stated in the Risk Evaluation framework rule, EPA interprets the statutory mandate to conduct risk evaluations and any

corresponding risk management to focus on uses for which manufacturing, processing, or distribution in commerce is intended, known to be occurring, or reasonably foreseen to occur (i.e., is prospective or on-going), rather than reaching back to evaluate the risks associated with legacy uses, associated disposal, and legacy disposal, and interprets the definition of “conditions of use” in that context.

Q: *Do you believe the Agency’s interpretation of ‘conditions of use’ is supported by Congressional intent?*

Answer:

Yes.

Background:

The statutory language provides the Agency with some discretion in identifying the uses that will be considered in a risk evaluation. These phrases include the statutory definition of ‘conditions of use’ - the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of” and how conditions of use should be addressed in the scope document - “the conditions of use that the Agency expects to consider in a risk evaluation.”

TSCA defines a chemical’s “conditions of use” as “the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of.” 15 U.S.C. § 2602(4). While EPA interprets this as largely a factual determination—*i.e.*, EPA is to determine whether a chemical substance is actually involved in one or more of the activities listed in the definition—the determination will inevitably involve the exercise of some discretion as evidence by the phrase “as determined by the Administrator”. As EPA interprets the statute, the Agency is to exercise that discretion consistent with the objective of conducting a technically sound, manageable evaluation to determine whether a chemical substance – not just individual uses or activities – presents an unreasonable risk. In that regard, EPA will be guided by its best understanding, informed by legislative text and history, of the circumstances of manufacture, processing, distribution in commerce, use and disposal Congress intended EPA to consider in risk evaluations.

In developing the scope of the risk evaluation, TSCA section 6(b)(4)(D) requires EPA to identify “the conditions of use that the Agency expects to consider in a risk evaluation,” suggesting that EPA is not required to consider all conditions of use. Consequently, EPA may, on a case-by-case basis, exclude certain activities that EPA has determined to be conditions of use in order to focus its analytical efforts on those exposures that are likely to present the greatest concern, and consequently merit an unreasonable risk determination. For example, EPA may, on a case-by-case basis, exclude uses that EPA has sufficient basis to conclude would present only “*de minimis*” exposures. This could include uses that occur in a closed system that effectively precludes exposure, or use as an intermediate. During the scoping phase, EPA may also exclude a condition of use that has been adequately assessed by another regulatory agency, particularly where the other agency has effectively managed the risks.

Q: Do you support the Agency's decision to define some of the key science terms/phrases in the final risk evaluation rule?

Answer:

In response to comments received on the proposed risk evaluation rule, as well as to increase clarity, confidence, and transparency, it was imperative to include definitions for key science terms such as “best available science”, “weight of the scientific evidence”, and “reasonably available information”. Given the overarching and inclusive principles in the final definitions, I don't believe that providing general definitions restricts flexibility or scientific advancement.

Background:

EPA has chosen to only define terms in this final rule that appear in the statute, including best available science, reasonably available information, and weight of the scientific evidence, among others.

Best available science. Section 26(h) of amended TSCA requires that “in carrying out sections 4, 5, and 6, to the extent that the Administrator makes a decision based on science, the Administrator shall use scientific information, technical procedures, measures, methods, protocols, methodologies, or models, employed in a manner consistent with the best available science.”

The definition codified in the rule originates from the Safe Drinking Water Act (SDWA) and is also included in the EPA's Information Quality Guidance and well as TSCA section 26(h), which identifies mandatory approaches to fulfilling the science standards under TSCA. By basing its definition of ‘best available science’ on these two sources, EPA believes that the Agency is remaining consistent with the current approach already used Agency-wide, while also acknowledging the specific standards under TSCA.

The final rule defines “best available science” as science that is reliable and unbiased. This involves the use of supporting studies conducted in accordance with sound and objective science practices, including, when available, peer reviewed science and supporting studies and data collected by accepted methods or best available methods (if the reliability of the method and the nature of the decision justifies use of the data).

Additionally, EPA will consider as applicable: –

- The extent to which the scientific information, technical procedures, measures, methods, protocols, methodologies, or models employed to generate the information are reasonable for and consistent with the intended use of the information;
- The extent to which the information is relevant for the Administrator's use in making a decision about a chemical substance or mixture;
- The degree of clarity and completeness with which the data, assumptions, methods, quality assurance, and analyses employed to generate the information are documented;
- The extent to which the variability and uncertainty in the information, or in the procedures, measures, methods, protocols, methodologies, or models, are evaluated and characterized; and;

- The extent of independent verification or peer review of the information or of the procedures, measures, methods, protocols, methodologies or models.

Reasonably available information. TSCA section 26(k) (15 U.S.C. 2625(k)) states that in carrying out risk evaluations, EPA shall consider information that is “reasonably available,” but the statute does not further define this phrase. In the final rule, EPA defines “reasonably available information” to mean information that EPA possesses, or can reasonably obtain and synthesize for use in risk evaluations, considering the deadlines for completing the evaluation.” Information that meets the terms of the preceding sentence is reasonably available information whether or not it is claimed as confidential business information.

Weight of the scientific evidence. The Agency is required by the statute to use a weight of scientific evidence approach in a risk evaluation and the Agency is codifying a definition of this term in this final rule. There are certain principles of weight of the scientific evidence that are universal, such as objectivity and transparency, and the general process, therefore EPA does not think that providing a general definition restricts flexibility or scientific advancement. For the purposes of this rule the definition EPA is adopting states: “Weight of the scientific evidence means a systematic review method, applied in a manner suited to the nature of the evidence or decision, that uses a pre-established protocol to comprehensively, objectively, transparently, and consistently identify and evaluate each stream of evidence, including strengths, limitations, and relevance of each study and to integrate evidence as necessary and appropriate based upon strengths, limitations, and relevance.” The bulk of the definition, aside from the phrase “applied manner suited to the nature of the evidence or decision” clarification, is taken directly from TSCA’s legislative history. See Congressional Record at S3519, June 7, 2016. The additional phrase was added to be consistent with the concept that the components of its risk evaluations will be “fit-for-purpose,” meaning that while EPA will always apply the principles contained in the definition, the depth or extent of the analysis will be commensurate with the nature and significance of the decision.

Q: *What are your views on considering aggregate exposure in a risk evaluation?*

Answer:

Under TSCA, EPA is required to describe whether aggregate or sentinel exposures to a chemical substance under the conditions of use were considered and the basis for that consideration. The decision to consider this type of exposure will necessarily be on a case-by-case basis, and must be supported by the best available science.

Background:

From the risk evaluation rule - Aggregate exposure means the combined exposures to an individual from a single chemical substance across multiple routes and across multiple pathways. This is consistent with the proposed rule and consistent with agency policy.

First 10 Chemical Risk Evaluations

Q: EPA has identified the first 10 risk chemicals for risk evaluations. Do you think these activities are on the right path?

Answer:

EPA recently published the scope documents for these first 10 chemicals. As I understand it, the tight time considerations and lack of an opportunity for public comment, the Agency committed to publishing problem formulation documents for each of the first 10 chemicals at the end of this calendar year. I support this decision. These documents will further narrow the scope with respect to conditions of use and exposures to be considered, and further define the process of systematic review of the information that will inform the risk evaluation.

Q: Please describe your understanding of the Agency's approach to 'conditions of use' in these scope documents.

Answer:

As I understand it, the final scope, which must specify the conditions of use that EPA expects to consider in the risk evaluation, will also identify whether particular conditions of use have been excluded as a result of this process, along with the Agency's rationale.

Q: Problem formulation documents for the first 10 risk evaluations are expected in December. What purpose do you believe these documents serve? How will these documents be different than the scopes?

Answer:

My understanding is that the Agency's intent with the Problem Formulation step is to further refine and narrow the scope documents, particularly with respect to which conditions of use will be included in the risk evaluation and which will not. For example, the scope documents do not include an examination of existing regulations that are already in place to manage risks of a particular chemical, whereas the problem formulation documents will.

Q: The Agency has said it will not be examining legacy uses of Asbestos. Do you agree with this position?

Answer:

Yes. The statutory mandate to conduct risk evaluations and any corresponding risk management to focus on uses for which manufacturing, processing, or distribution in commerce is intended, known to be occurring, or reasonably foreseen to occur (i.e., is prospective or on-going), rather than reaching back to evaluate the risks associated with legacy uses, associated disposal, and legacy disposal, and interprets the definition of "conditions of use" in that context. EPA may consider background exposures from legacy use, associated disposal, and legacy disposal as part of an assessment of aggregate exposure or as a tool to evaluate the risk of exposure resulting from non-legacy uses.

Q: The Agency decided not to consider all routes of exposure to 1,4 dioxane in the scope document. Was this appropriate? (This was the topic of a May 23, 2017 letter from Senators Gillibrand and Schumer).

Answer:

It is important to look into sources of contamination from 1,4-dioxane. I'm committed to protecting public health and will support the states to identify the appropriate steps to address the presence of 1,4-dioxane in water.

Background:

For 1,4-dioxane produced as a byproduct of reactions in the production of other chemicals, the EPA anticipates that 1,4-dioxane byproduct and contaminant issues will be considered in the scope of any risk evaluation of ethoxylated chemicals and is therefore not including it in the scope of the 1,4-dioxane risk evaluation. For example, Nonylphenol and Nonylphenol Ethoxylates (NP/NPE) are in the TSCA Work Plan and any 1,4-dioxane releases from NP/NPE manufacture, processing, use, or disposal will be evaluated then.

TSCA Confidential Business Information (CBI)

Q: EPA is required to review CBI substantiation at the time of submission and at other times. How will you ensure that the commitment to transparency that the new legislation calls for is being implemented?

Answer:

I am committed to faithfully carrying out EPA's responsibilities under TSCA, as amended, including reviewing the substantiation of Confidential Business Claims and ensuring the proper balance between providing information to the public and protecting Confidential Business Information (CBI).

Background:

The Frank R. Lautenberg Chemical Safety for the 21st Century Act introduced new requirements relating to the submission of CBI, its management, and periodic reviews of CBI claims, including expiration of CBI claims. All CBI claims must be substantiated at the time the information claimed as CBI is submitted to EPA, except for those types of information exempt under TSCA section 14(c)(2). EPA must, with limited exceptions, review all CBI claims for chemical identity, as well as a representative sample of at least 25% of other claims within 90 days of receipt. Other CBI claims may also be reviewed by the Agency based on specific events, such as pursuant to a Freedom of Information Act (FOIA) request, when a substance is designated as a high priority or active substance, or when the Agency believes that disclosure would be important in implementation of TSCA section 6. Most CBI claims expire after 10 years unless the information submitter reasserts and re-substantiates the CBI claim. Some stakeholders have claimed that the previous statutory language allowed overly broad CBI claims that this limited public access to chemical information. Section 14 of TSCA, as amended, was entirely replaced and therefore many of the requirements are new and require significant changes to data systems, processes and procedures.

Safer Choice Program

Q: The Safer Choice program uses hazard criteria to evaluate chemicals. How can you determine that products are appropriately identified for participation in this program without considering exposure and using a risk based approach?

Answer:

EPA engages in an open and transparent process to engage with all stakeholders and evaluates the physical and toxicological characteristics of chemicals to ensure that Safer Choice labeled products include the safest possible ingredients while still being effective.

Q: How does the Safer Choice program ensure that chemical manufacturers are appropriately engaged in developing the criteria?

Answer:

My understanding is that EPA works with manufacturers and retailers to ensure appropriate engagement from both manufacturers and retailers.

Background:

Each chemical ingredient in a formulation has a function in making a product work - whether it is to aid in cleaning by reducing surface tension (surfactants), dissolve or suspend materials (solvents), or reduce water hardness (chelating agents). Safer Choice focuses its review of formulation ingredients on the key (environmental and human health) characteristics of concern within a functional class. This approach allows formulators to use those ingredients with the lowest hazard in their functional class, while still formulating high-performing products. The Safer Choice criteria are based on EPA expertise in evaluating the physical and toxicological properties of chemicals. Safer Choice applies the criteria using EPA research and analytical methods to ensure that Safer Choice products contain only the safest possible ingredients.

EPA has, at times, heard criticism that the Safer Choice labeling program can create de facto “retailer regulations” because retailers who participate may exert power over manufacturers to change formulations thus creating an imbalance in the business relationship. However, the Safer Choice program deliberately engages with and includes manufacturers as partners to ensure their constructive involvement in developing labeling requirements. If the program were to end, NGO’s and/or retailers themselves would create their own labels resulting in a patchwork of requirements which would likely shift the control completely to NGOs and retailers.

Q: The fiscal year 2018 President’s Budget eliminates all funding for the Pollution Prevention program which includes the Safer Choice program. Are you aware of the broad support for the Safer Choice program from both industry and NGOs?

Answer:

Yes. I’m aware that industry has expressed significant support for the Safer Choice program and concern about its potential elimination in the FY 2018 budget. EPA received a letter from almost

200 partner companies and trade associations expressing concern with the potential elimination and support for the program.

Background:

Industry indicated that the program is an “invaluable resource to industry,” that helps consumers, businesses, and procurement officers identify products with reduced environmental and health hazards while maintaining the same level of performance. Industry also spoke to the advantage of a robust national program over a patchwork of logo programs promoted by retailers and NGOs. Industry also noted the balance struck between protecting trade secrets and providing information. Finally, they noted that the costs of other programs are rising while Safer Choice remains affordable for the 500 small business industry partners.

Formaldehyde

Q. Industry stakeholders have expressed significant concerns about costs and impracticable aspects of the Formaldehyde Standards for Composite Wood Products regulation. How would you propose that EPA address these concerns?

Answer:

My understanding is that EPA has recently published several actions amending this rule in response to stakeholder concerns. However, I’m committed to hearing additional stakeholder’s concerns, reducing regulatory burden where appropriate, and clarifying requirements.

Background:

The Formaldehyde Standards for Composite Wood Products (TSCA Title VI)

On July 27, 2016, EPA finalized a rule to implement TSCA Title VI to reduce formaldehyde emissions from composite wood products. The statute established the same formaldehyde emission standards for composite wood products including hardwood plywood, medium-density fiberboard, and particleboard, as established by the CARB ATCM, directed EPA to address areas not included in CARB’s standards and deferred to EPA to determine whether laminated products should be regulated.

Final Rule Implementing TSCA Title VI

On December 12, 2016 rule requiring composite wood products to be tested, certified, labeled and records kept, the rule also establishes a third-party certification program and includes procedures for the accreditation bodies (ABs) and third-party certifiers (TPCs).

Changes to final Rule

Compliance Dates

The final rule effective date was extended from February 10, 2017 to May 22, 2017 through a direct final rule and parallel proposal on May 24, 2017 to extend the compliance dates; however, negative comment was received so EPA has withdrawn the direct final rule and is now proceeding to issue a subsequent final rule.

Early Labeling

EPA has issued a direct final rule and parallel proposal to allow regulated composite wood products and finished goods that meet the formaldehyde emissions standards, and have been certified by an EPA-recognized TPC, to be voluntarily labeled as compliant as soon as

compliance can be achieved before the emission standards, labeling, and recordkeeping compliance date.

Voluntary Consensus Standards

EPA will also soon issue a direct final rule and parallel proposal voluntary consensus standards incorporated by reference in the rule to newer versions of those same standards to allow regulated entities to use most current standards, consistent with CARB.

Lead

Q: There are significant concerns from constituents regarding the Renovation, Repair and Painting Rule requirements and implementation. What would you do to address these concerns?

Answer:

I look forward to learning more about this rule and these concerns. I welcome a continuing dialogue on this issue with you and your office, as well as any interested stakeholders.

Q: EPA has been petitioned to update the lead hazard standards, but hasn't yet taken action. What is your position on this matter? Would you update the standards to reflect the best available science on lead?

Answer:

I look forward to learning more about the issue and the underlying science. I understand that this matter is actively undergoing review by the Court. EPA and the petitioners filed briefs in January and oral arguments occurred in June. EPA is currently awaiting the court's decision.

Q: EPA never finalized a rule to address lead in public and commercial buildings, although doing so is statutorily mandated, and EPA committed to completing its work by March 31, 2017. The problem of lead contamination in this country is not going away, as evidenced by the crisis in Flint, MI. How do you intend to move forward on this important rulemaking?

Answer:

I'm not familiar with the specifics of this rulemaking. However, I am cognizant of the dangers posed by lead and am fully committed to reducing instances of lead poisoning, where possible.

Background:

Stakeholders have been critical of the RRP rule due to costs of implementing the work practice and training requirements and for the amendment that removed the ability of homeowners to opt out of having contractors follow the requirements if no children or pregnant women live in the home. Stakeholders have also been critical of the economic analysis that estimated costs under the assumption that a test kit would be available to meet the positive and negative criteria set forth in the regulation. They argue that renovators are being made to follow the work practices when lead at the regulated level may not be present due to a "false positive" test result.

403 Hazard Standards litigation: On August 24, 2016, several plaintiffs filed a petition seeking a court order compelling EPA to issue a proposed rule within 90 days of that order, and a final rule within six months. Petitioners contend that EPA has unreasonably delayed its commitment to

initiate a rulemaking to lower the hazard standard for lead in dust. On August 24, 2016, several plaintiffs filed a petition seeking a court order compelling EPA to issue a proposed rule within 90 days of that order, and a final rule within six months. Petitioners contend that EPA has unreasonably delayed its commitment to initiate a rulemaking to lower the hazard standard for lead in dust. On January 17, 2017, EPA filed its brief and declaration; petitioner's response brief was filed on January 27, 2017; oral argument occurred June 12, 2017. EPA is waiting on a decision from the court.

Public and Commercial Buildings Litigation: Litigants informed DOJ/OGC in December 2016 that they intend to reactivate the litigation instead of negotiating a new settlement deadline when EPA missed the previous settlement deadlines. Litigants informed DOJ/OGC in December 2016 that they intend to reactivate the litigation instead of negotiating a new settlement deadline. No further discussions with litigants have occurred and EPA missed the March 31, 2017 deadline.

Polychlorinated Biphenyls (PCBs)

Q: PCBs have been identified in school buildings across the country, threatening the health and safety of our children. What would you do to address the dangers of PCBs in schools?

Answer:

Providing accurate and consistent technical information to the relevant states and localities is a key first step. EPA has Q&A guidance on addressing PCBs in school buildings that should be helpful those cities dealing with legacy PCB contamination. Where appropriate, OCSPP can and should review its continued-use authorizations for certain uses of PCBs.

Background:

PCBs were used in hundreds of industrial and commercial applications from 1929 until the manufacture, processing, distribution in commerce and use of PCBs was banned under Section 6(e) of TSCA in 1979. TSCA Section 6(e) provides that, if it can be demonstrated that there is no unreasonable risk of injury to health or the environment, then EPA may authorize continued uses of PCBs by regulation and PCBs are still authorized for use in certain applications including electrical equipment. OCSPP oversees the continued use of PCBs in buildings and equipment, while the Office of Land and Emergency Management (OLEM) oversees the disposal of PCBs. Schools built or renovated between 1950-1979 have widespread use of polychlorinated biphenyls (PCBs) containing building materials (e.g., non-liquid PCBs in caulk and paint, and liquid PCBs in fluorescent light ballasts (FLB)). EPA is aware of a number of incidents involving releases of PCBs from FLBs in schools that have occurred across the country including hundreds of incidents in New York City, Los Angeles and elsewhere. EPA sent a proposed rule to the Office of Management and Budget (OMB) in late 2016 to end the use authorization for PCB-containing fluorescent lights ballasts (FLB) in schools and daycare centers after December 31, 2020. Per OMB request, this proposal was withdrawn in January 2017.

Per- and Polyfluoroalkyl Substances (PFOA/PFAS)

Q: Certain geographical hotspots have PFOA/PFAS exposures that are higher than the general population (e.g. Parkersburg, WV; Decatur, AL; Hoosick Falls, NY)? How would you ensure that these hotspots are adequately protected from PFOA/PFAS exposures?

Answer:

I understand that in 2006, EPA, in cooperation with eight major leading companies in PFAS industry, launched a PFOA Stewardship Program with the goal of eliminating these chemicals from emissions and products by 2015, and that all participating companies have met the PFOA Stewardship Program goals. The amendments to TSCA provided OCSPP with improved authority to regulate existing chemicals. However, I would need to learn more about what other actions are potentially underway, and other options we may have under our new statutory authority to reduce exposures, after I have joined EPA and been briefed on this issue.

Q: The chemical GenX has been detected in the Lower Cape Fear River in NC, a drinking water source for thousands of North Carolinians. The finding appears in direct conflict with an EPA consent order that mandates minimal releases to water. The company is claiming their releases fell under a “byproduct” loophole. EPA has yet to take action. What would you do to ensure this situation is remedied and does not occur again?

Answer:

I understand that EPA is already investigating the company’s compliance with the requirements of a 2009 Consent Order issued under TSCA section 5 requiring control of releases to the environment associated with production of GenX at the company’s Fayetteville, N.C. EPA is also reviewing additional toxicity data submitted by the company, as required under the Consent Order, and is updating the risk assessment using more recent production data and the additional GenX toxicity data.

Q: Do you agree with the commitment made by EPA Administrator Pruitt during his confirmation hearing regarding the importance of working quickly to undertake further testing for PFOA and potentially regulating or banning these chemicals?

Answer:

I support the commitment made by Administrator Pruitt to address this issue.

Background:

In 2006, EPA, in cooperation with eight major leading companies in PFAS industry, launched the 2010/2015 PFOA Stewardship Program with the goal of eliminating these chemicals from emissions and products by 2015. All participating companies have met the PFOA Stewardship Program goals EPA remains concerned about the ongoing uses of PFOA and related chemicals that are still available in existing stocks or are being newly introduced by companies not participating in the PFOA Stewardship Program.

On January 21, 2015, EPA proposed a Significant New Use Rule (SNUR) that requires manufacturers (including importers) and processors of PFAS chemicals, including as part of articles, to notify EPA at least 90 days before starting or resuming new uses of the chemicals in any products.

PFAS chemicals lack evaluated, quantitative toxicity information and validated analytical methods. The lack of information and methods makes it difficult for EPA Offices and Regions to make evidence-based decisions regarding potential human health risks from ongoing or future exposures

The N.C. Department of Environmental Quality (DEQ), in consultation with the N.C. Department of Health and Human Services (DHHS), is leading a state investigation into reports of an unregulated chemical known as GenX (replacing PFOA) in the lower Cape Fear River in N.C. Chemours, the company that produces the chemical at its facility in Fayetteville, N.C., maintains that it is currently capturing, removing and disposing of wastewater that contains the byproduct GenX. EPA's health advisory for PFOA and PFOS combined is 70 ppt. There is no EPA health advisory level for GenX. NC DEQ and DHHS are continuing to investigate the levels of GenX in the lower Cape Fear region. On July 17, NC Governor Cooper sent a letter to EPA urging EPA to set limits, revisit the consent order, and require Chemours to submit additional studies on GenX.

January 18, 2017 Testimony excerpt:

Mr. Pruitt. The TSCA authority that has been granted by this body, you and I talked about that in your office, PFOA needs to be addressed quickly, even under the Safe Drinking Water Act as well.

Senator Gillibrand. Will you commit to doing that work?

Mr. Pruitt. Yes, Senator.

TSCA Section 6 Rules

Q: EPA has proposed regulations to address unreasonable risks from Trichloroethylene and paint removers. Will you expeditiously finalize those proposed rules?

Answer:

I'll need to be briefed further on this issue. I understand that EPA is in the process of reviewing comments received on these two proposals to determine potential paths forward.

Q: If EPA's proposal on Methylene Chloride was finalized would it have prevented the recent death in Ashland City TN?

Answer:

I am not aware of the details regarding the investigation into this death and therefore am unable to comment.

Background:

TCE is a volatile organic compound (VOC) and hazardous air pollutant (HAP) classified as a human carcinogen. In the June 2014 TSCA Work Plan Risk Assessment for TCE, EPA identified acute and chronic non-cancer and cancer risks associated with TCE use in commercial degreasing and some consumer uses.

Methylene chloride is a volatile solvent that is a probable human carcinogen used in consumer and commercial paint and coating removal; at least one worker death annually is attributed to methylene chloride in bathtub refinishing. NMP is a developmental toxicant presenting risks of fetal death and decreased birthweight; it is used in consumer and commercial paint and coating removal and is often a substitute for methylene chloride in consumer uses.

On December 7, 2016, under section 6(a) of TSCA, EPA proposed to ban uses of TCE as an aerosol degreaser and for spot cleaning in dry cleaning facilities as a result of health risks identified in a 2014 TSCA Chemical Work Plan Chemical Risk Assessment for TCE. The comment period closed on March 16, 2017, and EPA received 28 comments on the proposed rule.

On January 19, 2017, under section 6(a) of TSCA, EPA proposed to ban the use of TCE in commercial vapor degreasing as a result of health risks identified in a 2014 TSCA Chemical Work Plan Chemical Risk Assessment for TCE. The comment period closed on May 19, 2017, and EPA received 544 comments on the proposed rule. This proposed rule and a proposed rule on TCE in spot cleaners in dry cleaning and consumer and commercial aerosol spray degreasing are planned to be finalized together in one action.

On January 19, 2017, under section 6(a) of TSCA, EPA proposed to regulate NMP and methylene chloride in paint and coating removal. The comment period closed on May 19, 2017, and EPA received 1,401 comment on the proposed rule.

TSCA, as amended, allowed for these proposals to move forward under the risk assessments that had already been completed prior to the new prioritization and risk evaluation processes in the amended statute.

On August 30, 2017, EPA published a Federal Register Notice announcing that we will a workshop on the use of methylene chloride in furniture refinishing on September 12, 2017. EPA has heard about the death of a worker employed as a bathtub refinisher, which appears to be associated with exposure to methylene chloride. Kevin Anthony Hartley, age 21, of Ashland City, Tennessee died on April 28, 2017. OSHA is investigating this death.

Regulatory Burden Reduction Executive Order and TSCA Implementation

Q: How do you believe the Executive Orders issued by this Administration on burden/regulation reduction will impact TSCA implementation?

Answer:

I believe the Executive Orders will have no impact on the effective implementation of TSCA. I expect that the Executive Orders will help ensure that necessary regulations are designed to be

effective and efficient in reaching regulatory goals, and those not necessary, effective, or efficient will be repealed, replaced, or modified.

Background:

On January 30, 2017, President Trump issued EO 13771 on Reducing Regulation and Controlling Regulatory Costs. In sum, it includes requirements including that:

- agencies identify two existing regulations to be repealed whenever an agency proposed or otherwise promulgates a new regulation
- for fiscal 2017, agencies must ensure that the total incremental costs of all new regulations, including repealed regulations, to be finalized this year must be no greater than zero, unless otherwise required by law or consistent with advice provided in writing by the Director of OMB.
- Any new incremental costs associated with new regulations must, to the extent permitted by law, be offset by the existing costs associated with at least two prior regulations.

On February 24, 2017, President Trump issued EO 13777 on Enforcing the Regulatory Agenda; it is designed to reduce the regulatory burdens agencies place on the American people, and it directs agencies to take several activities to further this goal, including:

- the designation of a Regulatory Reform Officer and the establishment of a regulatory reform task force which is charged with evaluating existing regulations and making recommendations (informed by stakeholder input) to the Administrator regarding those that can be repealed, replaced, or modified to make them less burdensome.

Does EPA have enough information to evaluate the risk of most chemicals?

Q: Do you think EPA has enough information to evaluate the risks of most chemicals?

Answer:

This is a chemical-by-chemical issue due to the heterogeneity of chemicals and their specific uses covered under TSCA. However, if for a particular chemical, the Agency determines there is not enough information, the amended law provides authorities to obtain additional information in order to conduct a comprehensive risk evaluation.

Background:

This lack of information was known by the drafters of the amended TSCA, and the amended law gives the Agency more flexibility and authority to obtain the information needed to fully evaluate chemicals for their risks to human health and the environment. For new chemical pre-manufacturer notices, the law provides the provision for the Agency to determine that there is not enough information, and the law also provides additional authorities to obtain additional information when necessary for existing chemical evaluations.

**OFFICE OF SCIENCE
COORDINATION AND POLICY
(OSCP)**

Science Coordination

Q: The Office of Chemical Safety & Pollution Prevention (OCSPP) is a government leader in the development and regulatory use of computational toxicology (CompTox) and high throughput screening (HTS) and testing of chemicals. What are your thoughts on this emerging science and what is your commitment to the further integration of alternative approaches into OCSPP endeavors?

Answer:

Use of these technologies allows more chemicals to be assessed in fraction of the time as traditional methods, for a fraction of the cost. The use of HTS and CompTox in EPA chemical assessments is especially exciting because it can significantly reduce the costs and burdens on the regulated community. This will also add to the body of knowledge about mechanisms, mode of adverse outcomes supporting the relevancy of decisions. This will be especially important for EPA programs that have been traditionally “data poor” (e.g., OCSPP’s Office of Pollution Prevention & Toxics (TSCA) and EPA’s Office of Water). The Endocrine Disruptor Screening Program (EDSP) has already announced that it will accept computational toxicological data as an alternative for three of its eleven traditional EDSP Tier 1 guideline studies. Development of the High Throughput (HTS) alternatives for the remaining eight EDSP Tier 1 guidelines are underway. The use of Computational toxicology will allow the OCSPP to implement TSCA more quickly and efficiently.

Background:

- High throughput assays are automated methods that allow for a large number of chemicals to be rapidly evaluated for a specific type of bioactivity at the molecular or cellular level. This approach, which can help identify compounds that may modulate specific biological pathways, was initially developed by pharmaceutical companies for drug discovery. The results of these methods provide an initial understanding of a biochemical interaction and possible role of a chemical in a given biological process(es).
- Computational Toxicology, or “CompTox”, uses computer models and high throughput cell-based methods in place of traditional animal-based chemical testing of apical endpoints.
- High throughput assays can be run for a range of test chemical concentrations and produce concentration-response information representing the relationship between chemical concentration and bioactivity. The concentration-response data from multiple assays can be mathematically integrated in a computational model of a biological pathway, providing values representative of a chemical's bioactivity in that pathway (e.g., estrogen receptor pathway). To reduce non-specific results, the computational model can use results from multiple assays and technologies to predict whether a chemical is truly bioactive in the pathway being evaluated and does not get confounded by nonspecific interference with a single assay.

Q: Another OCSPP area of emerging science is the use of a Systematic Review Framework and methods to extract, review and integrate existing data and literature. Please describe its

advantages and how you would leverage this approach to improve efficiency and transparency in the program and throughout EPA.

Answer:

Systematic Review is an important tool that increases the transparency and the reproducibility of the scientific/regulatory decisions the Agency makes. The Systematic Review approaches will inform the registration and review of pesticides and is critical to the continued evaluation of industrial chemicals under TSCA.

Background:

- Systematic Review, as described in the National Research Council Review of EPA's Integrated Risk Information System (IRIS) Process (2014), is "a scientific investigation that focuses on a specific question and uses explicit, pre-defined scientific methods to identify, select, assess, and summarize the findings of similar but separate studies." Simply put, systematic review is a method of determining which scientific studies can and should be reviewed to make decisions about a specific scientific question.
- To answer important environmental health science questions, federal agencies and other entities have developed several approaches to implement systematic review. These approaches share a common pre-defined framework that include:
 - Defining a specific research question
 - Developing clear search strategy to identify relevant studies
 - General agreement on inclusion and exclusion criteria for relevant studies, and individual study evaluation criteria
 - Integrating data to answer the research question
 - Identification of biases and confounding results
- OCSPP's OSCP leads development of the OCSPP systematic review framework to harmonize approaches for the collection, evaluation, and integration of data for human health and ecological risk assessments in OCSPP.
- OCSPP's OSCP co-leads EPA's Systematic Review Community of Practice (CoP).
- The TSCA Framework rules emphasize the importance of systematic review and transparency.

Q: Describe your vision of how OCSPP will foster an improved Quality Assurance (QA) program including auditing Good Laboratory Practices (GLPs) of Industry test data.

Answer:

The Agency has proposed changes to the Pesticide Registration Improvement Act (PRIA) (a.k.a. PRIA 4) for augmentation (via fees) for both GLP & PRIA programs. This GLP Audit Program will cover both national as well as test data submissions conducted outside the United States.

Background:

- EPA's Good Laboratory Practice Standards (GLPS) compliance monitoring program ensures the quality and integrity of test data submitted to the Agency in support of a pesticide product registration under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), section 5 of the Toxic Substances Control Act (TSCA),

and pursuant to testing consent agreements and test rules issued under section 4 and 5 of TSCA.

- Data obtained through laboratory inspections and data audits is used by the Agency to regulate the use of pesticides and industrial chemicals.
- FIFRA amendments passed by Congress in 2004 created a registration service fee system for applications for specific pesticide registration, amended registration, and associated tolerance actions. The goals of this fee system are to:
 - Create a more predictable evaluation process for affected pesticide decisions, and
 - Couple the collection of individual fees with specific decision review periods.
- The 2004 amendments are also known as the Pesticide Registration Improvement Act of 2003 (PRIA).
- PRIA fees have been reauthorized twice, most recently by the Pesticide Registration Improvement Extension Act (PRIA 3). This reauthorization expires September 30, 2017.
- PRIA 4 is pending before the current Congress.

Q: Scientific Integrity is an important part of the foundation for the use of science in decision-making for the Federal Government (especially in a regulatory setting). The independence of scientific investigation & evaluation from political manipulation and the correct attribution of intellectual contribution & providing a “safe haven” for dissenting scientific opinion has become increasingly important to EPA. Discuss how you plan to ensure Scientific Integrity in OCSPP.

Answer:

EPA bases all decisions on sound science. Science cannot be considered “sound” unless it is 100% founded on Scientific Integrity principles (objectivity, clarity, reproducibility and utility). Scientific Integrity remains integral to all science and regulatory decisions within OCSPP and it will continue to be so under my watch.

Background:

- Scientific Integrity results from adherence to professional values and practices, when conducting and applying the results of science and scholarship. It ensures:
 - Objectivity
 - Clarity
 - Reproducibility
 - Utility
- Scientific Integrity is important because it provides insulation from:
 - Bias
 - Fabrication
 - Falsification
 - Plagiarism
 - Outside interference
 - Censorship
 - Inadequate procedural and information security

Q: How do you intend to improve Science Coordination within OCSPP, within EPA, and within the Federal Government? How do you intend to improve Science Coordination internationally and with the regulated community?

Answer:

The emerging science within OCSPP (HTS, CompTox, Systematic Review, Cheminformatics, etc.) will be coordinated with other parts of the Agency to leverage/maximize its use. I will conduct outreach to the regulated community to hear underrepresented opinions and concerns. I will promote the United States' tremendous scientific expertise to our international partners and encourage harmonization of regulatory frameworks to provide a greater certainty for the regulated community.

Q: How do you intend to continue and improve the Endocrine Disruptor Screening Program (EDSP)?

Answer:

I will follow on with the success of the implementation of High Throughput Screening (HTS) and CompTox approaches into the EDSP based on appropriation support from Congress. Current activities within the EDSP include the continued transition to the use of HTS and CompTox tools to screen thousands of chemicals for endocrine activity, establishing policies and procedures for screening and testing, exploring approaches to predict other toxicological endpoints/outcomes, and evaluating data to ensure chemical safety by protecting public health and the environment from endocrine disrupting chemicals.

Background:

- The Endocrine Disruptor Screening Program (EDSP) prioritizes, screens and tests pesticides and other environmental contaminants for potential effects on estrogen, androgen, and thyroid hormone systems in humans and wildlife.
- The EDSP was mandated by the Food Quality Protection Act (FQPA) of 1996.
- The FY 2018 President's budget eliminates programs that are mature, duplicative, or can be absorbed into other programs, are equally conducted or eligible under other programs, or are or could be state and local responsibilities.
- The Endocrine Disruptor Screening Program (EDSP) is a mature program that was established in 1996 under authorities contained in the Federal Food, Drug and Cosmetic Act (FFDCA) and the Safe Drinking Water Act (SDWA) amendments.
- The *in vitro* high throughput and computational model alternatives provide an accurate quantitative measure of specific endocrine receptor binding bioactivity and mechanisms that can serve as alternatives to the current Tier 1 estrogen receptor (ER) binding, ER transactivation (ERTA) and uterotrophic assays.

Science Peer Review (FIFRA SAP and TSCA SACC)

Q: How can the EPA assure stakeholders and the public that it is relying upon the best available peer reviewed scientific and technical data when data/models/tools may not be easily identified or made available to the public either because of Confidential Business Information

(CBI)/Intellectual Property (IP) claims or because limited information is available in peer-reviewed journals?

Answer:

Science is the backbone of EPA's decision-making. EPA relies upon the integrity of the science to accomplish its mission to protect human health and the environment. EPA's scientific integrity efforts include focusing on the promotion of a culture of transparency throughout the Agency; the release of scientific information to the public; and the consistent use of peer review and federal advisory committees (FACs). The Agency will continue its efforts to improve public participation activities by expanding its utility in the use of the federal register docket, the FIFRA SAP and SACC websites, systematic review process and adherence to Agency guidelines and procedures. In addition, the Agency continues to promote open access and public accessibility to both the government-funded intramural and extramural data.

Background:

- EPA's Scientific Integrity Policy provides a framework to promote scientific and ethical standards and to create a proactive culture to support them.
- Scientific integrity helps to build public support. People are more likely to support the Agency if they can trust the quality and integrity of its work.

Q: In previous years, stakeholders have expressed concerns that EPA's Federal Advisory Committee meeting processes and approaches are inconsistent throughout the Agency. These concerns include the selection of peer review members of various panels (i.e., FIFRA SAP, SAB) and the consideration of responses to public and peer review comments. Can you assure the Agency will operate consistently within its FACA meeting processes/procedures?

Answer:

Yes, certainly. While many FACA committees may have unique statutory authorities related to their mission, objectives, scope of activity and general operational characteristics such as membership and designation have to be consistent with FACA rules. Each committee must file an active charter which consists of the estimated number of members, a description of the expertise required, and/or groups to be represented in order to achieve a balanced diverse membership. Due to the increase in public interest and participation in our FACs, the Agency has expanded its use of logistical and administrative meeting support services to compile and process voluminous comments in support of its meetings. The Agency will continue to adhere to the FACA guidelines and procedures in promoting accountability to the committee's charge and to the public.

Background:

- FACA is the Federal Advisory Committee Act (FACA) of 1972.
- The selection of committee members is made based on FACA's requirements and specific statutory authority of a given committee along with the potential committee member's background, experience and qualifications.
- FACA requires that committee memberships be "fairly balanced in terms of the points of view represented and the functions to be performed."

- In balancing committee memberships, agencies are expected to consider a cross-section of those directly affected, interested, and qualified, as appropriate to the nature and functions of the advisory committee.

Q: Peer review is important to the quality assurance process. How will you ensure the EPA's OCSPP will have a robust quality assurance program that evaluates whether its peer review recommendations and public comments are completely and adequately addressed?

Answer:

Based on the 2017 Office of Inspector General's (OIG) report, the OIG determined EPA's system of controls to manage the recommendations and advice from FACs to be effective. The OIG also determined the Agency could improve its transparency to the public. To strengthen the agency's system of controls and improve public transparency, I would ensure posting all responses to an online platform in the format of a response to comments/reconciliation memorandum document, as per the EPA Peer Review Handbook (2015, 4th Edition).

Background:

- Refers to the March 13, 2017 Office of Inspector General Report entitled "EPA Has Adequate Controls to Manage Advice From Science and Research Federal Advisory Committees, but Transparency Could Be Improved Report No. 17-P-0124".

Q: How will you ensure that the Agency's peer review process is void of conflicts of interests in the evaluation of complicated scientific issues?

Answer:

The Agency will continue to adhere to applicable federal ethics statutes and regulations when selecting scientists as Special Government Employees (SGEs) [non-government employees] or Regular Government Employees (RGEs). SGEs/RGEs must complete/submit financial disclosure provisions of the Ethics laws. Each candidate's financial disclosure forms will be evaluated by the Designated Federal Official (DFO), Executive Secretary of the committee, and Deputy Ethics Official for OSCP to determine whether there are conflicts of interest (COI) and/or appearance of lack of impartiality. Review of additional information will also be evaluated to determine any appearance of a lack of impartiality. Furthermore, candidates are evaluated in accordance with the following guidance and databases: EPA Federal Advisory Committee Act Review Handbook; House and Senate Registry Databases (listing of all federally registered lobbyists); Google and PubMed Searches, individual social media searches (e.g., LinkedIn).

Background:

- FACA candidates are subject to applicable federal ethics statutes and regulations including the financial disclosure provisions of the Ethics in Government Act (5 U.S.C. §§ 101-111) and 5 C.F.R. Part 2634.